

A map of Washington state showing its counties and major cities. The map includes latitude and longitude markings. The word "WASHINGTON" is written across the center. The map shows the state's borders with Oregon to the south and Idaho to the east. Major cities like Seattle, Tacoma, and Spokane are labeled. The map also shows the Pacific Ocean to the west and the Columbia River to the north.



Prepared by

the

Forest Inventory and Analysis Work Unit

Pacific Northwest Research Station

USDA Forest Service

FIELD INSTRUCTIONS FOR THE
INVENTORY OF WESTERN WASHINGTON
1988-1989

prepared by
Glenda C. Goodwyne

TABLE OF CONTENTS

CHAPTER	COLOR	PAGE
I. INTRODUCTION	WHITE	7
II. PLANNING TRAVEL AND LOCATING THE PLOT	PINK	11
III. PLOT AREA IDENTIFICATION	GREEN	18
IV. PLOT REFERENCING AND LAYOUT	YELLOW	32
V. PLOT AREA CLASSIFICATION	BLUE	47
VI. POINT CLASSIFICATION	PINK	66
VII. TRACKABLE TREE TALLY	GREEN	85
VIII. STOCKING TREE TALLY	BLUE	118
IX. SNAG TALLY	YELLOW	124
X. APPENDICES	PINK	132
INDEX	WHITE	158

I. INTRODUCTION	7
Purposes of this manual.	8
Organization of this manual.	8
The inventory of western Washington.	8
Sample design	9
Additional sources of documentation.	9
II. PLANNING TRAVEL AND LOCATING THE PLOT	11
Before leaving base camp	12
Checklist of items needed on plot.	12
Landowner contact.	13
Plot location aids	14
Locating the plot on the ground	14
Previously measured plots	14
New plots	15
Plots with active logging	16
III. PLOT AREA IDENTIFICATION	18
Determine if plot is in the inventory unit	19
Plot area identification items	19
Item 1--County	20
Item 2--Plot number	20
Item 3--Sample kind	20
Item 4--Owner class	22
Owner Codes	23
Item 5--Date of OCC 3 inventory	24
Item 6--Date of OCC 2 inventory	24
Item 7--OCC 3 ground land class	24
GLC codes	24
Item 8--OCC 2 ground land class	25
Item 9--Forest land stratum	25
Item 10--PI Direction	26
Ground land class.	26
Minimum area rules.	26
Minimum length and width of stringers	26
Identifying boundaries between land classes	28
Ground land class definitions	31

IV. PLOT REFERENCING AND LAYOUT	32
Referencing the plot	33
Reference point (RP)	33
Point-of-departure (POD)	34
Referencing point 1.	34
Referencing all other points	36
Plot layout.	37
Objectives	37
OCC3 plot layouts	37
Standard 5-point layout	39
1-point other forest	39
Point numbering	40
Rules for moving and substituting points.	40
How to move or substitute points	41
Examples of moved and substituted points	45
V. PLOT AREA CLASSIFICATION	47
Plot area classification items	48
Item 11--Precipitation.	48
Item 12--Elevation	48
Item 13--Plant Association.	49
Item 14--Stand condition	52
Plot physioclass items.	53
Item 15--Plot aspect	53
Item 16--Plot slope.	53
Item 17--Type of logging	53
Item 18--Soil depth	53
Item 19--Kind of harvest since OCC 2.	54
Item 20--Kind of harvest before OCC 2	55
Item 21--Date of harvest since OCC 2.	55
Item 22--Date of harvest before OCC 2	55
Item 23--Silvicultural treatment OCC 2.	56
Item 24--Treatment Opportunity	57
Item 25--Hardwood site	58
Numbers of points measured at OCC 3	68
Item 26--# N/R	58
Item 27--# N	58
Interactive Items.	59
Crew identification	59
OCC 3 plot layout	59
Present condition/Past disturbance	59
Field check item	59
Contact office about.	59
OCC2 GLC Correct?	59
Pinprick correct?	59
Owner response.	61
Owner class correct?.	61
Site index data	61
Plot Site Index.	62
Objective	62
Tree selection.	62
General rules for selecting site trees	62
King's method for selecting D-fir & w. hemlock	62
Data recording.	64
Site Tree Data Flow	65

VI. POINT CLASSIFICATION	66
Section I	67
Point number	67
Physioclase information	67
Aspect	67
Slope	67
Stream class	67
Stream proximity	68
Section II	69
Nonstockable area	69
Hardwood site	72
Root disease	73
Guide for identifying major root diseases	76
General root disease symptoms	76
Individual disease descriptions	76
Section III--Vegetation profile	78
Objective	78
Sample design.	78
Percent cover of all shrubs and all herbs.	79
Percent cover by plant species and by layer	80
Plant species that occasionally attain tree size	80
Section IV--Heights of canopy layers	82
 VII. TRACKABLE TREE TALLY	 85
Tree selection	86
3.3-m fixed-radius & NE quadrant	86
BAF 7 prism plot & 17-m fixed-radius plot	89
Tree identification and measurement	91
Item 1--Line number.	91
Item 2--Point number	91
Item 3--Tree history	93
Item 4--Species.	94
Monumenting information	95
Item 5--Azimuth	95
Item 6--Distance	95
Item 7--Tree number	95
Item 8--OC2 INC	96
Item 9--OC2 dbh	96
Item 10--OCC 3 dbh.	97
Item 11--OC2 height	102
Item 12--OCC 3 height	102
Item 13--Breast-high age	104
Item 14--OC2 crown ratio	106
Item 15--OCC 3 crown ratio	106
Item 16--OC2 crown class	106
Item 17--OCC 3 crown class	106
Item 18--Growth impactor	108
Guide for identifying insect damage	111
Item 19--Cause of death	112
Item 20--Dwarf mistletoe	112
Item 21--Bigleaf maple clump	113
Item 22--Cull other.	114
Item 23--Cull rot category	116

VIII. STOCKING TREE TALLY	118
Objectives.	119
Layout and numbering of stocking points	119
Special considerations for laying out stocking points	120
Tree selection--3.3-m fixed-radius plot	120
Tree identification and measurement	122
Item 1--Line number	122
Item 2--Point number	122
Item 3--Species	122
Item 4--OCC3 diameter	122
Item 5--OCC3 height	122
Item 6--Breast-high age	122
Inhibiting vegetation on stocking points	123
IX. SNAG TALLY	124
Objectives	125
When to collect snag data	125
Tree selection--7 M BAF prism tally & 17-meter fixed-radius plot.	125
Tree identification and measurement	126
Item 1--Line number.	126
Item 2--point number	126
Item 3--Tree history	126
Item 4--Species	126
Item 5--Azimuth	126
Item 6--Distance	126
Item 9--OC2 dbh	126
Item 10--OC3 dbh	126
Item 11--OC2 height	127
Item 12--OC3 height	127
Item 18--Growth Impactor/Damage death.	128
Item 19--Cause of death/Use or Circumstances of disappearance.	128
Item 24--OCC 3 Decay class	129
Characteristics of Douglas-fir snags by decay class	130

X. APPENDICES	132
Appendix 1--Field Crew Edit	133
Appendix 2-A--Sample landowner letter	134
Appendix 2-B--Sample release letter	135
Appendix 3--Checkplot procedures.	136
Appendix 4--Slope correction table	142
Appendix 5--Limiting distance tables for 7M BAF prism	143
Appendix 6--Metric equivalents	144
Appendix 7--OCC2 codes for damage/cause of death & log deductions .	145
Appendix 8--Tally guides and sample plot records	148
INDEX	158

I. INTRODUCTION

TABLE OF CONTENTS

	PAGE
I. INTRODUCTION	7
Purposes of this manual.	8
Organization of this manual.	8
The inventory of western Washington.	8
Sample design	9
Additional sources of documentation.	9

I. INTRODUCTION

This manual describes the procedures for field plot measurement used by the Forest Inventory and Analysis (FIA) Research Work Unit in the 1988-1989 inventory of western Washington.

The Portland FIA Project of the Pacific Northwest Research Station (PNW), USDA Forest Service, is one of seven such work units across the United States. The PNW Forest Inventory and Analysis project at Portland is responsible for inventorying the forest resources of the Pacific Coast States (Oregon, Washington, and California).

A. Purposes of this manual. This manual serves two major purposes:

1. to instruct field personnel in how to locate and measure field plots in the 1988-1989 inventory of western Washington.
2. to document the field procedures and codes used in the inventory. Documentation is needed by members of the Research Work Unit (RWU) and by the various "customers" of FIA data.

B. Organization of this manual. This manual is structured primarily for ease of use by field personnel. Each chapter corresponds either to a separate function that must be performed in locating and measuring a field plot, or to a unique section of data recording that must be completed. Information that is infrequently used or that is included here for documentation purposes is contained in the appendices at the end of this manual. In addition, a glossary and an index are provided for quick reference.

C. The inventory of western Washington.

1. Background. In western Washington, FIA collects data on lands in all ownership except National Forest, Reserved areas, and Census water. The 1988-1989 inventory of western Washington represents the third measurement (Occasion 3) of this area by FIA, using the "cluster" plot layout. Western Washington is made up of three units: Southwest, Olympic Peninsula, and Puget Sound. Western Washington plots were previously measured in 1963-1967 (Occasion 1) and in 1978-1979 (Occasion 2).
2. Objectives. FIA provides information needed by resource planners, policy analysts, and others involved in forest resource decision-making. The collected data are summarized, analyzed, interpreted, and published in statistical and analytical reports for the U.S., for western Washington and for various geographic areas within Washington. Published data will include information on: forest land area; timber volume; forest growth, cut, and mortality; potential forest productivity; opportunities for silvicultural treatment; kinds and amounts of wildlife habitats; forest ownership, and resource zones. FIA also provides data to answer additional questions about western Washington's forest resources as they arise.

3. The sample design. The FIA sample design is double sampling for stratification. The primary sample consists of permanent photo points. In the Occasion 2 (OCC 2) inventory, land class, owner class, and development zones were identified for each photo point, and the timberland points were also assigned to a photo-volume class. National Forest and reserved areas were not inventoried at OCC 2.

In the current inventory, the permanent PI grid covers all ownerships and all lands in western Washington. All points will be used to determine sample area. In the FIA sample area photo points falling in areas where trees are present will be examined with stereoscopes and placed in a forest land stratum. If the point is forest land, a plant association and stage of development will be identified, and if sawtimber, stand height and density will also be identified. Permanent points that were examined at OCC 2 will also be examined for change.

The secondary sample, or ground sample, consists of every sixteenth photo point. In the OCC2 western Washington inventory, permanent field plots were established at approximately 1,000 timberland locations. In the current inventory (OCC3), approximately 186 of these plots will be remeasured, and some new plots will be established. Remeasurement plots in stands that were intermediate or mature at OCC2 will be "walk-through" plots; ongrowth trees will not be tallied. Plots not qualifying as walk-throughs will be full remeasurement plots. On some full remeasurement plots, temporary plots for stocking data will be established--generally plots <5.0 cm average dbh at OCC2, and plots that have been clearcut since OCC2.

D. Additional sources of documentation. More information on the procedures followed in the 1988-1989 inventory of western Washington are available from the following documents, on file at the RWU in Portland, Oregon:

1. Field instructions for the inventory of western Washington--1978/79.
2. Western Washington PI manual for 1988-89.
3. Study plan for the inventory of western Washington.
4. Western Washington inventory techniques manual.

[this page for notes]



"Summer of a birthmark, Hal."



"Randy! Just sit down, eat your cereal, and look for that thing later!"

II. PLANNING TRAVEL AND LOCATING THE PLOT

TABLE OF CONTENTS

	PAGE
II. PLANNING TRAVEL AND LOCATING THE PLOT	11
Before leaving base camp	12
Checklist of items needed on plot	12
Landowner contact	13
Plot location aids	14
Locating the plot on the ground	14
Previously measured plots	14
New plots	15
Plots with active logging	16



Interplanetary luggage mix-ups

II. PLANNING TRAVEL AND LOCATING THE PLOT

A. Before leaving base camp.

- (1) Make sure the landowner has been contacted (see section below on landowner contact).
- (2) Plan the route to the plot. Always select two or more extra plots to take along.
- (3) Leave word of your plot locations and expected destinations.
- (4) Make sure your vehicle has all of the necessary equipment and a plot map.
- (5) Reach agreement with your partner(s) on a work procedure.

B. Checklist of items needed on plot.

OCC1 plot records and photos

Plot jacket (OCC 2 & 3 plot records & photos, root rot sheet)

Hand-held data recorder & extra batteries (AA)

Pencils

Note pad(s)

DATA RECORDING

Calculator

Tatum and tatum aids

Field manual(s) & Data recorder manual

Plant guide(s)

Plot (road) map

Stereoscope(s) (2x and/or 4x)

Photo scale (Timber Survey Aid #16))

Straight edge

PHOTO INTERPRETATION

Pinprick(s)

Hand lens

Prism(s)

Compass(es)

Clinometer(s)

Diameter tape(s)

PLOT MEASURING

30-meter tape(s)

Hand axe(s)

Increment borer(s)

Paper bags for root disease samples

B. Checklist of items needed on the plot continued

Cedar stake	
Steel plot pins	
Nails	
Tree number tags	PLOT REFERENCING
Square tags	
Round tags	
Flagg'n (Pictures 0' Texas, preferably)	
First aid kits	FIRST AID
Bee sting and/or snake bite kits	
Canteens	
Lunches	MISC. PERSONAL
vest, hardhat, rain gear and extra clothing	

C. Landowner contact. During ownership collection, the name and address of each landowner was collected from county courthouse records.

1. Landowners of small tracts. In preparing for the field season, the Portland office sent each landowner of privately-owned, non-timber industry plots (owner class codes 41 and 61) a letter describing our inventory and asking permission to measure the plot. We enclosed a signed release letter and a self-addressed postcard (for their reply) with each letter. Examples of the types of correspondence are in Appendix 2.

Either written or spoken landowner permission must be obtained before a plot is measured. This responsibility lies either with the field coordinator or the field crew. In either case, information useful for owner contact has been recorded on a 3 X 5 card inserted in the plot jacket if the owner has responded to our letter. If there is no owner response, the owner name and address from courthouse records will be listed on a printout. Notes from any phone conversations with landowners or circumstances such as locked gates or washed-out roads, will be noted on the plot attribute record under Interactive Items.

2. Landowners of large tracts. Owners of large land areas encompassing many plots--primarily private timber companies and public agencies--are contacted individually by the Portland office and/or by field personnel. Access information for these plots will be provided.

3. Harvest information. If feasible during landowner contact, confirm date of harvest since OCC2. (See Item 21, p. 55).

D. Plot location aids.

Each field crew should have a road map covering the general plot area and a plot packet for each plot you plan to visit. The plot packets, which were assembled in the Portland office for each field plot, contain: the OCC 1, 2 and 3 plot cards and photos; computer-printed plot and point attribute records; computer-printed tree tally records (trackable tree tally records listing standing dead and live trees at OCC 2); stocking tree tally record and point mapping record.

You may use the road map, plot cards from OCC 1, 2, and 3, and aerial photos to locate the plot. The county, plot number, and legal description (township, range, section, and forty) are printed on the plot attribute record. Plot locations are marked and numbered on the plot map. Use the plot map to reach the general vicinity of the plot by motor vehicle. Once you have reached the area covered by the photos, you may use the photos to find the exact plot location on the ground.

For remeasurement plots, the plot location is pinpricked and circled on the OCC2 photos. The plot number is marked in the upper right-hand corner on the front of the old photo, and on the backside near the circled pinprick. Many of the OCC1 photos have true azimuth and photo scale determined on the backside. The plot number is also marked on the upper right-hand corner of the new photos. For remeasured plots, the OCC 2 plot card has a section "Route to RP" which sometimes provides information useful for locating the plot.

For new plots, the plot location is pinpricked and circled on the OCC3 photos. The plot number is marked in the upper right-hand corner and on the backside near the circled pinprick.

E. Locating the plot on the ground.

1. Previously measured plots. For remeasurement plots (sample kinds 1,2 or 7, as printed in Item 3 on the plot attribute record), use both new and old photos to proceed to the plot area. It is usually easiest to use the OCC 3 photos to arrive at the general location and the OCC 1 and 2 photos to find the exact location of the plot. You will usually find a tagged/numbered tree on one of the sample points before finding the RP tree. In this case, use the OCC 2 plot card to determine which sample point you are on. It is usually easier to go directly from here to point 1 (the pinpricked location) than to try to locate the RP tree. Note: on the OCC 1 plot card, the azimuths recorded for point 1 reference trees are from tree to point.

The RP tree has square aluminum tags on two sides of the tree, 2 meters above ground line, and one square aluminum tag below stump height facing towards point 1. If needed, travel notes, remarks, and a description of the RP trees can be found on the front of the OCC 2 tally sheet and the back of the OCC 2 photo. Before beginning the traverse from the RP to the plot, check the photos to see if the azimuth and distance seem reasonable. Some photos will be marked with a point-of-departure (POD). They are usually near a road and indicate how the crew arrived at the plot area.

If you are having difficulty finding the plot, follow these steps:

- a.) Check the photos to be sure you are in the right spot, making certain that you can see on the photos exactly what it is you see on the ground.
- b.) If the plot area is indistinct, look for stream confluences, ridges, openings, groups of large trees, old skid roads, large snags etc. on the ground, to locate yourself on the photos. Follow your way back to the pinprick location on the ground. Be confident you are at the pinprick.
- c.) Try to locate the area the previous crew might have been when they thought they were at the pinpricked location.
- d.) Check the plot card for information such as:
 - (1) Remarks which say "Point center moved back 20 feet on same azimuth to agree with photo pinprick."
 - (2) Stand type and size of trees. If the plot is in large sawtimber stand of fir, the crew would know they were off if they were in a pole stand of pine.
 - (3) The size and species of the RP and point 1 reference trees.
 - (4) Direction of travel from the RP--it could be 180 degrees off.
 - (5) Any other indicator such as slope and aspect.

2. New plots.

- a.) Locating a plot by inspection. For plots established at OCC 2, and that have no previous photo coverage, use the OCC 3 photos to proceed to the pinpricked location by photo interpretation. If a crew ground-checked the plot at OCC 2, they may have recorded information on the OCC 2 plot card which could be helpful in relocating the plot. When you reach the point you believe is the pinpricked location, carefully check the photos against the surrounding terrain and vegetation to make sure you are in the correct spot.

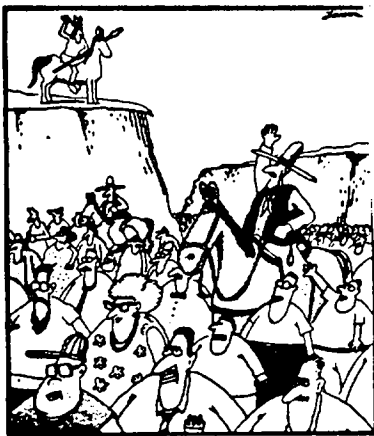
b.) Locating a plot with an RP and baseline. You may encounter a plot that is difficult to locate using photo interpretation. In this case you may establish a baseline on the OCC 3 photos to determine true photo azimuth and scale. Once the baseline is established:

- (1) Select, tag, pinprick, and measure an RP (preferably within 200 m of the plot (see p. 33)).
- (2) On the photos, draw a straight line between the RP and pinpricked location.
- (3) Determine the azimuth and distance from the RP to the plot using Timber Aid #16.
- (4) Measure out the calculated azimuth and distance to the pinprick location and flag it. Carefully check the photos against the surrounding terrain and vegetation to make sure you are actually in the correct spot. When the pinprick location on the ground is determined, locate point 11 with a cedar stake to begin the plot.

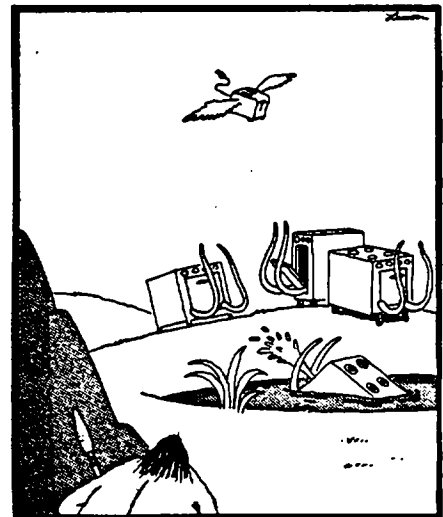
F. Plots with active logging.

If you arrive at a plot location and find the area is being logged (timber has been or is being felled, bucked, or yarded), DO NOT ESTABLISH THE PLOT. Note on the plot jacket the status of the logging operation and return the plot to the field coordinator. The field coordinator will hold the plot until later in the season, when the status of the logging operation will be checked again to see if the plot can be completed.

[this page for notes]



The Great Nerd Dive of '76



Early appliances

III. PLOT AREA IDENTIFICATION

TABLE OF CONTENTS

	PAGE
III. PLOT AREA IDENTIFICATION	18
Determine if plot is in the inventory unit	19
Plot area identification items	19
Item 1--County	20
Item 2--Plot number	20
Item 3--Sample kind	20
Item 4--Owner class	22
Item 5--Date of OCC 3 inventory	24
Item 6--Date of OCC 2 inventory	24
Item 7--OCC 3 ground land class	24
GLC codes	24
Item 8--OCC 2 ground land class	25
Item 9--Forest land stratum	25
Item 10--PI Direction	26
Ground land class	26
Minimum area rules	26
Minimum length and width of stringers	26
Identifying boundaries between land classes	28
a.) Maintained structures	28
b.) Indefinite forest boundary	28
c.) Distinct forest boundary	29
d.) Isolated vegetation or natural nonvegetated stringer	29
e.) Intermingled vegetation or natural nonvegetated stringer	30
f.) Land class amputation by cultural nonforest stringers	30
Ground land class definitions	31

III. PLOT AREA IDENTIFICATION

A. Determine if plot is in the inventory unit. Before establishing, remeasuring, or classifying a plot in the field, make sure the point 1 location is within the inventory sample area. Although the office staff has attempted to identify these plots in advance of field work using maps, ownership records, and aerial photos, certain situations can only be identified on the ground. For the plot to be out of the inventory unit, one of the following statements must be true:

1. Point 1 is on National Forest land.
2. Point 1 falls in an area that is reserved from timber harvest by law or official policy. Nature conservancies and National and State parks are included, as are most County and Municipal parks.
3. Point 1 falls in a body of water over 16 ha (40 acres) in size, or a river over 200 meters wide. This condition occurs when a new reservoir is flooded or a river changes channels.

Measure the plot unless one of these three conditions is clearly met. Write the reason for any discrepancy in the "Contact Office About" section on the plot attribute record and the plot jacket. Before leaving the plot area, check to make sure the pinpricked location on the OCC1, 2 and 3 photos agrees with the ground location of the plot. Upon completion, forward the plot to the inventory leader for review.

If the point 1 location is in the inventory unit, but part of the plot falls out of the inventory, see instructions for moving and substituting points p. .

B. Plot area identification items. Items 1-9 on the plot attribute record must be completed for all plots (see the tally guide for the plot attribute record, Appendix 11). Many items have been printed by the computer; others need to be completed by the field crew. Use the following guidelines to complete the area identification items.

1. Item 1--County. This 3-digit code, printed/downloaded by the computer, identifies the county the plot is in. The county codes are listed below, along with the declinations to be used in the counties, and the reporting unit in which the county lies--(SW) Southwest, (PS) Puget Sound, or (OLY) Olympic Peninsula.

CODE	COUNTY	DECL	EAST	UNIT	CODE	COUNTY	DECL	EAST	UNIT
009	Clallam	22		OLY	049	Pacific	21 1/2		SW
011	Clark	21		SW	053	Pierce	22 1/2		PS
015	Cowlitz	21		SW	055	San Juan	22 1/2		PS
027	Grays Harbor	21 1/2		OLY	057	Skagit	22 1/2		PS
029	Island	22		PS	059	Skamania	20 1/2		SW
031	Jefferson	22		OLY	061	Snohomish	22		PS
033	King	21 1/2		PS	067	Thurston	21 1/2		OLY
035	Kitsap	22		PS	069	Wahkiakum	21		SW
041	Lewis	21 1/2		SW	073	Whatcom	22 1/2		PS
045	Mason	22		OLY					

2. Item 2--Plot number. 3-digit code, printed by the computer. On remeasurement plots, The printed/downloaded OCC 3 plot number is the same as the OCC 2 plot number.

3. Item 3--Sample kind. 1-digit code, printed/downloaded by the computer, which may be changed in the field. The classification of sample kind is based on the plot's OCC2 tally, the cutting history since OCC2, its OCC2 ground land class, and whether sample points were established at OCC2. The sample kind designation serves these purposes:

- a.) it tells the field crew what type of field work is required at a particular sample location (see the tally guides for the plot and point attribute records and the tree tally sheets, Appendix 10);
- b.) it tells the data compilation section how to process the plot in the office by indicating what kind of plot data was collected by the field crew (e.g. a one-point plot, a 5-point plot with remeasurement information, a 5-point plot with all new data, etc.)
- c.) it is used in the data edit program to double check the accuracy and completeness of other plot variables.

Plots were screened in the office and assigned one of 9 sample kinds below:

<u>CODE</u>	<u>SAMPLE KIND</u>	<u>DESCRIPTION</u>
1	5-point remeasurement with stocking points	A 5-point plot was established and measured at OCC 2 and fully remeasured at OCC3 with stocking points. Includes plots clearcut since OCC2. OCC2 GLC 20; OCC3 GLC 20.
2	5-point remeasurement without stocking points	Same as SK 1 without stocking points.
3	5-point reconstructed with stocking points	A 5-point plot was established and measured at OCC2, OCC2 GLC 20, OCC3 GLC 20. Includes plots not established at OCC2 that should have been and lost and reconstructed plots at OCC3 with stocking points.
4	5-point reconstructed without stocking points	Same as SK 3 without stocking points.
5	5-point new with stocking points	A 5-point plot not measured at OCC2. A 5-point plot established and measured at OCC3. Includes plots that were nonforest at OCC2, forest at OCC3 and plots that are new-to-the-inventory.
6	5-point new without stocking points	Same as SK 5 without stocking points.
7	5-point walk-through	A 5-point plot established and measured at OCC2, walked-through at OCC3. OCC2 GLC 20; OCC3 GLC 20.
8	1-point other forest	A 1-point plot with vegetation profile plot established at OCC3. OCC3 GLC=41,44,46.
9	Nonforest plot	No plot established. OCC3 GLC=61-69,92

You should accept the office-assigned sample kind UNLESS you encounter one of the following situations:

- (1) A sample-kind 1, 2 or 7 plot cannot be relocated (i.e. it is a lost plot). A plot of this type would become either a sample kind 3 or 4 (exclude recent clearcuts), depending on whether stocking data are collected (see chapter IX).

(2) The GLC of an office-assigned sample kind 8 plot is found to have been misclassified at OCC2 and is a GLC 20 and therefore a sample kind 3 or 4, depending on whether stocking data are collected (see chapter IX).

(3) A plot is found to be nonforest, and is therefore a sample kind 9. This condition may result either from misclassification at OCC2, new rules interpretation (e.g. falls on cutbank), or land conversion from forest to nonforest. On the hardcopy plot card, correct OCC2 GLC to match OCC3 in cases of misclassification at OCC2 and return the plot to lead analyst for immediate review.

(4) A plot of office-assigned sample kind 7 has been clearcut since OCC2, therefore, it is SK 1.

(5) If an office-assigned sample kind 9 plot has become forested (GLC 20) since OCC2, it is now SK 5 (always need S-points).

If you encounter one of these situations, update the sample kind. Describe on the plot attribute record the reason for the change, and indicate in the "Contact Office About" section.

4. Item 4--Owner class. 3-digit code, printed by computer for all plots. The code indicates the broad ownership class of the plot. Ownership data were collected in the county courthouse prior to field data collection. The data are used in compiling forest statistics. If evidence indicates the printed/downloaded owner class is incorrect, circle "NO" in "Owner class correct?", note the source of information and the updated owner class in the space provided by the field coordinator).

OWNERSHIP CODES

Owner Class

07	National parks, monuments, and other federal	}	(Reserved)
08	The Nature Conservancy and The Audubon Society	}	"
09	Indian	}	"
10	Bureau of Land Management	}	"
12	Bureau of Land Management (BLM)	}	(Public)
14	Miscellaneous (all other) federal	}	"
15	State owned (other than DNR)	}	"
16	County and municipal	}	"
17	Washington Department of Natural Resources (DNR)	}	"
18	State	}	(Reserved)
19	County and municipal	}	"
21	Forest industry (with mill)	}	(Private)
41	Farmer owned	}	"
61	Miscellaneous private	}	"
71	Like forest industry	}	"
98	Census water	}	(Reserved)
603	Gifford Pinchot National Forest (NF)	}	(Public)
605	Baker Snoqualmie NF	}	"
609	Olympic NF	}	"
		}	"
800	Indian, allotted lands	}	"

INDIAN, TRIBAL LANDS

805	Chehalis	817	Quinalt	}	"
806	Hoh	818	Shoalwater	}	"
807	Lummi	819	Skagit	}	"
808	Makah	820	Skokomish	}	"
809	Muckleshoot	821	Squaxin Island	}	"
810	Nisqually	822	Swinomish	}	"
811	Nooksack	823	Tulalip	}	"
812	Saul-Saiattle	826	Lower Elwha	}	"
813	Port Gamble	830	Snohomish	}	"
814	Port Madison	831	Upper Skagit	}	"
815	Puyallup	832	Stillaguamish	}	"
816	Quileute	898	Suquamish	}	"

5. Item 5--Date of OCC 3 inventory. Record a 4-digit code. The first 2 digits refer to the month; the second 2 digits refer to the year. Use the following coding system:

** EXAMPLE: June 1988
would be coded "0688".

6. Item 6--Date of OCC 2 inventory. 4-digit code printed/downloaded by computer. Indicates the month and year of the OCC 2 inventory. Uses the same codes as Item 5.

7. Item 7--OCC 3 ground land class. 2-digit code that describes the ground land class (GLC) of the point 1 (pinpricked) location. GLC is used to identify photo interpretation errors and for making forest area estimates.

The OCC3 GLC is the same as the OCC2 GLC unless a real GLC change occurred on the ground since OCC2. Such changes should be noted during photo interpretation or plot screening and will be indicated on the plot attribute record.

Field crews should record an OCC3 GLC different from OCC2 when they verify that there has been an actual, physical change on the ground since the OCC2 inventory. If such change has occurred, note on the plot attribute record in "Contact Office About" and submit to lead analyst for review.

GLC codes. The GLC codes are as follows:

<u>Code</u>	<u>Ground land class</u>
20	Timberland
41	Rocky
44	Oak other hardwood
46	Other forest unsuitable site
	<u>Nonforest</u>
61	Cropland
62	Improved pasture
63	Natural rangeland or abandoned farmland
64	Other farmland including farmsteads
65	Marsh
66	Cultural nonforest stringers - 5-m wide and wider constructed roads, powerlines, pipelines, and railroads.
67	Urban - townsites and areas of clustered suburbs, residential industrial buildings. (Forest 3.0 ha or more in urban areas are classed as forestland)
68	Naturally nonvegetated - barren rock, sand, and glaciers.
69	Christmas tree lands, nurseries
92	Water - includes lakes .4-16 ha and streams 10-200 meters wide.

8. Item 8--OCC 2 ground land class. 2-digit code printed by the computer, using the same codes as in Item 7. This is the ground land class at OCC 2. If there is disagreement with the OCC2 GLC classification, code Y in "OCC2 GLC UPDATED?" and note the reason in "CONTACT OFFICE ABOUT" on the plot attribute record.

9. Item 9--Forest land stratum. 2-digit code printed on the plot attribute record. This is the classification made by the photo interpreter and is not a field entered item. FLS is never changed in the field. If the photo is mispinpricked, indicate in Interactive Items, correct the pinprick, and note in "Contact Office About" whether re-PI is necessary. If so, the plot will be re-PI'ed and FLS will be updated in the office by the data manager.

Code Description

Timberland

- 20 Now timberland--nonforest at OCC2
- 21 Conifer volume < 2000 ft³/acre at OCC2, clearcut since OCC2
- 22 Conifer volume > 2000 ft³/acre at OCC2, clearcut since OCC2
- 23 Density of all live trees < 25%.
- 24 Density of all live trees ≥ 25%, density of conifers <25%.
- 25 Density of conifer trees ≥ 25%.

Other forest

- 41 Other forest, rocky
- 44 Other forest, oak-madrone
- 46 Other forest, unsuitable site

Nonforest

- 60 Nonforest at occasion 2 and occasion 3
- 69 Christmas tree plantations, nurseries.
- 71 Nonforest, agriculture, at occasion 3; timberland at occasion 2.
- 72 Nonforest--cultural stringer at occasion 3, timberland at occasion 2.
- 73 Nonforest--urban at occasion 3, timberland at occasion 2.
- 74 Nonforest--noncensus water at occasion 3, timberland at occasion 2.
- 75 Nonforest at occasion 3, other forest at occasion 2.

10. Item 10--PI Direction. 2-digit code printed on the plot attribute record describing the direction that the point was photo-interpreted (PI'ed).

C. Ground Land Class--Definitions and classification rules.

2. Minimum area rules.

All land class areas must be at least .4 hectares or larger and 35 meters wide to be recognized, except:

a.) Cultural nonforest stringers (constructed roads, railroads, powerlines, pipelines, and canals) 5 meters wide or wider and .4 hectares or larger are called nonforest.

b.) Streams 10 meters wide and wider and .4 hectares or larger are called nonforest.

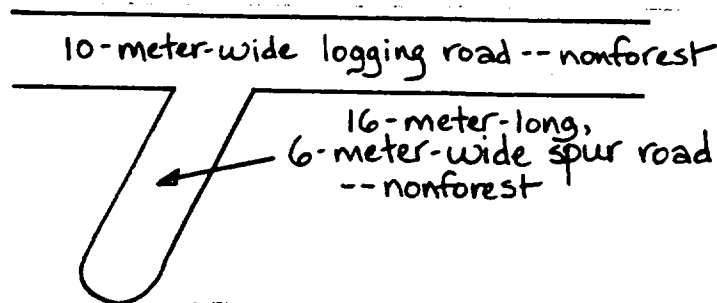
Whenever the point falls in an area less than the minimum recognized, the area will be classed like the surrounding land class.

5-meter-wide cultural nonforest stringers must be at least 800 meters long to be .4 hectares. 10-meter-wide streams and cultural nonforest must be at least 400 meters long to be .4 hectares.

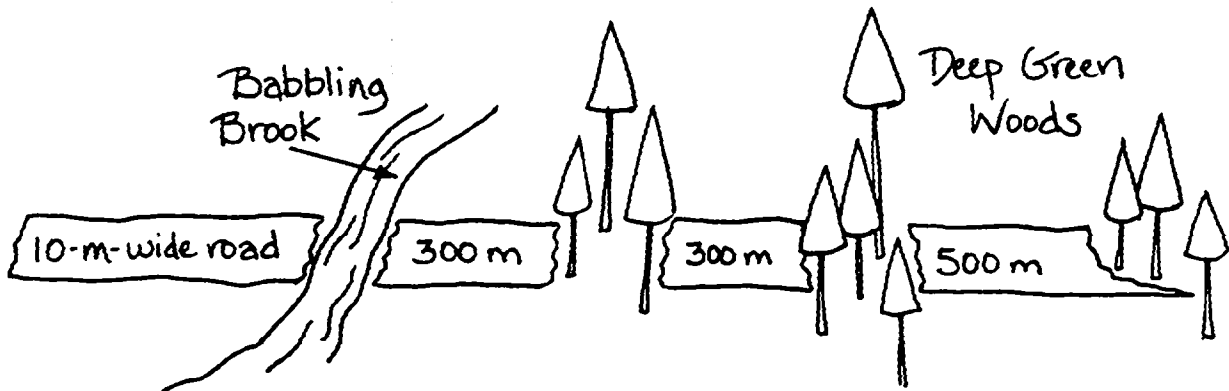
Constructed roads are made for car or truck travel. They are used "to get somewhere" and not to skid logs. They are made using machines other than cars or trucks. Cutbanks along constructed roads are classified as nonforest regardless of the vegetation they support. "Cutbanks" include area that is engineered "cut" or "fill," part of the road design, where the original topography has been disturbed and modified as a result of roadbuilding.

3. Minimum length and width of stringers.

All forks of constructed roads, streams, etc. are called nonforest if they are wide enough, regardless of length (see figure below). A fork of a 5-meter-wide constructed road connected to other nonforest is nonforest regardless of length. The same rule applies to railroads, streams, etc.



If use of a constructed road, railroad, powerline, etc. is blocked by forest vegetation, the area on either side of the block must meet the minimum width and area rules before it is considered nonforest. If a constructed road becomes narrower than 5 meters and then widens to more than 5 meters, or if the road changes to nonconstructed and back to constructed, the narrow or nonconstructed portion must be 800 meters long to be classed differently than the rest of the road. Example:



The 10-meter-wide constructed road has not been maintained for 15 years. It is driveable to the point where Babbling Brook has washed out the culvert. Three hundred meters beyond the washout the Deep Green Woods has reclaimed the road and 10-meter-tall Douglas-fir block the road at intervals. The road is nonforest up to the first patch of trees. It is then forest except for the 500 meter nontree stretch, which is nonforest.

When measuring the width of constructed roads, railroads, powerlines, etc., include all areas that are kept free of tree size vegetation. Include brushed out, cut, or sprayed areas along right-of-ways when they appear different from the adjacent forest land. Include cutbanks, which are classified as nonforest regardless of the vegetation they support. Cutbanks include area that is engineered "cut" or "fill," part of the road design, where the original topography has been disturbed and modified as a result of road-building.

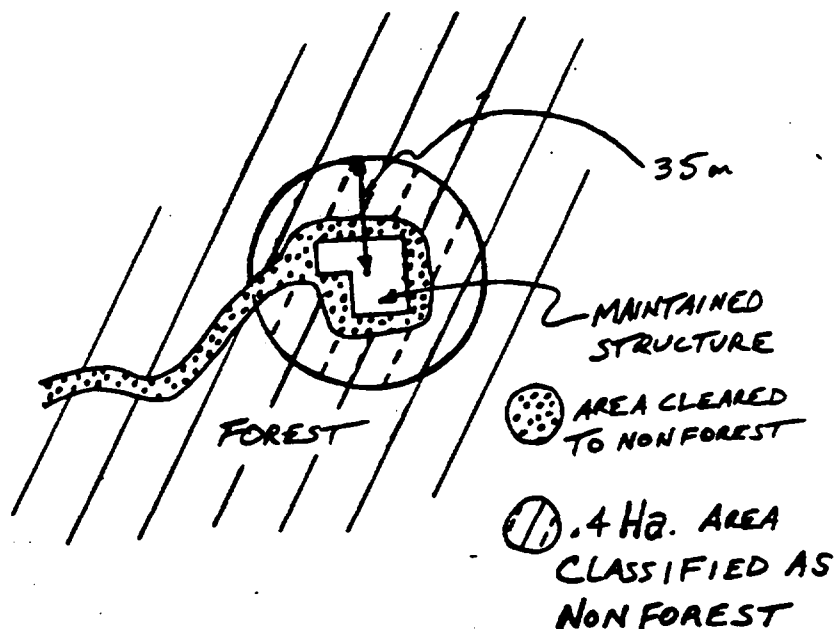
When measuring stream width, include all area where the action of water prevents growth of trees to merchantable size. Classify stream margins, sand bars, and islands as nonforest if high water prevents trees from growing to a height of 4 meters.

Measure the width of cultural nonforest stringers and streams as the average width of stringer above and/or below point 1. For 5-meter-wide stringers, look at 800 meters of stringer; for 10-meter-wide streams look at 400 meters; for natural stringers (which have to be 35 m wide) look at 114 meters. The point can be anywhere within this specified length of stringer.

4. Identifying boundaries between land classes.

a.) Maintained structures.

Maintained structures will automatically define a .4 hectare nonforest area. Isolated pumphouses, sheds, and other structures in forested areas are not considered "maintained structures" if the primary use of the area is timberland.

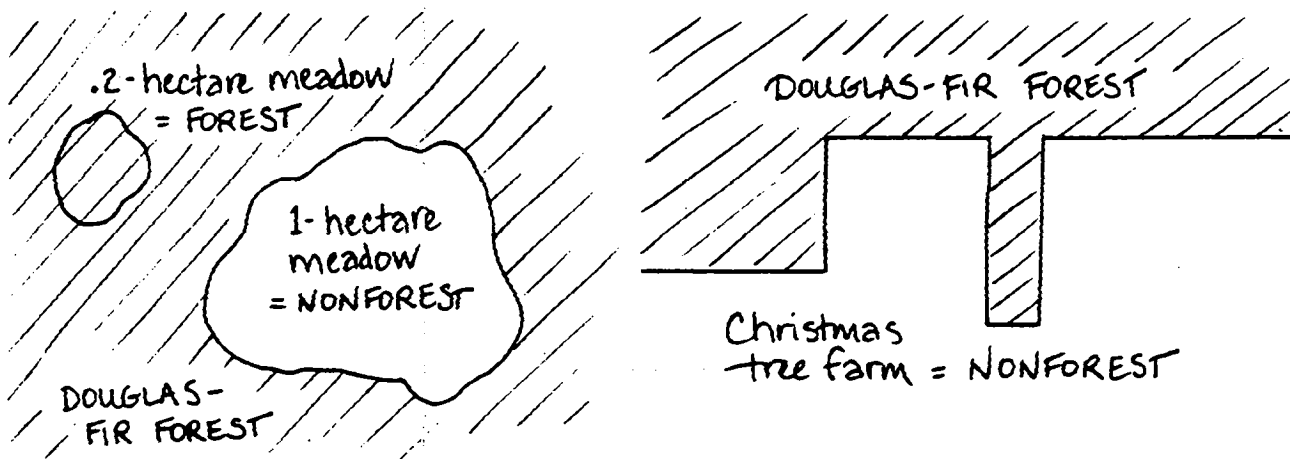


b.) Indefinite forest boundary.

In areas where trees or tree indicators are present, there may be no distinct boundary between forest and nonforest. Decide if the pinpricked location is more like forest or nonforest. If it is more like forest, establish a forest plot locating all points on land which is more like forest. Refer to p. 31 for definition of forest and nonforest land.

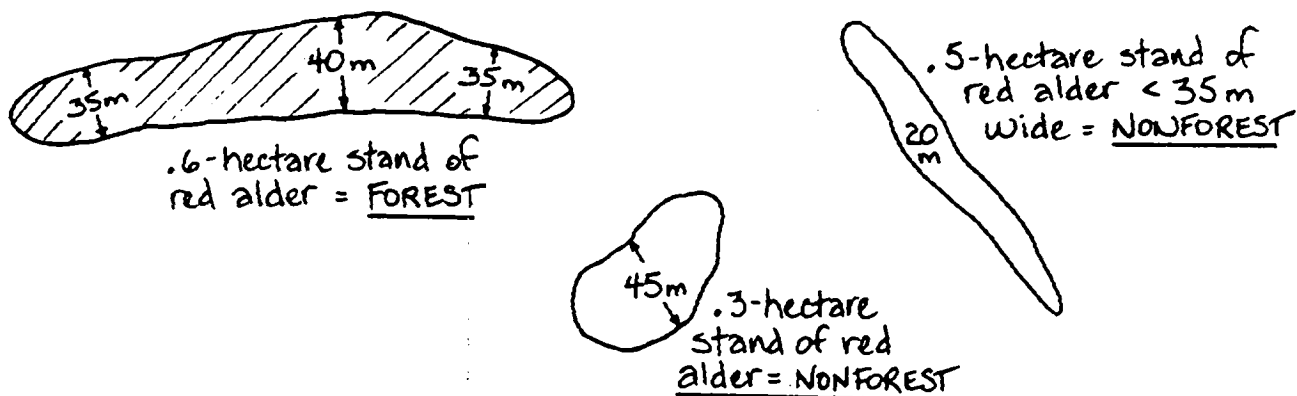
c.) Distinct Forest Boundary.

Distinct forest boundaries define the land class boundaries (see figure below). Stringers of forest land extending into nonforest land and separated by a distinct boundary will be classed as forest only if they are at least 35 m wide. The same is true of a nonforest stringer extending into forest land. Necks of forest land less than 35 meters wide but less than 35 meters long and connected to a tract that is at least 35 meters by .4 hectare in size will be classed as forest.



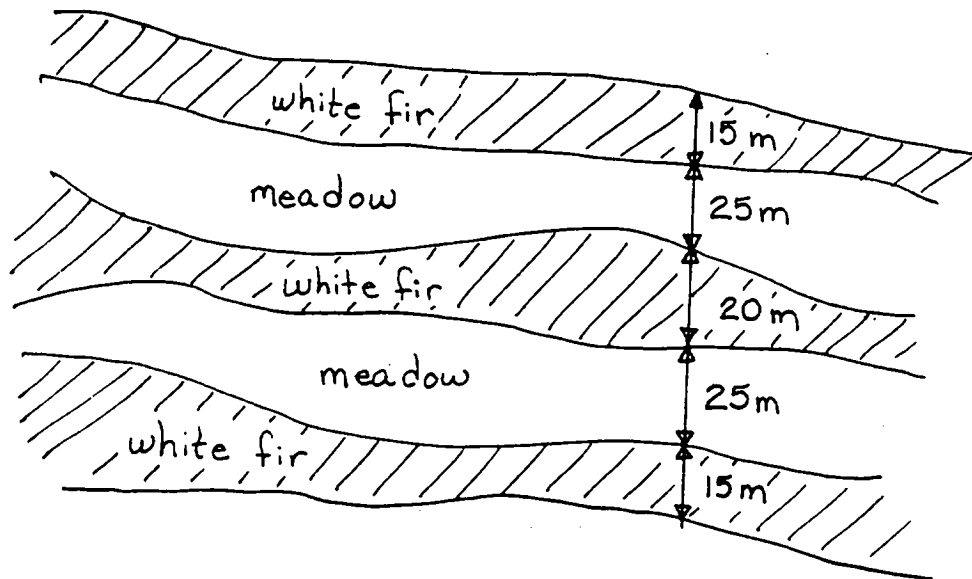
d.) Isolated vegetation or natural nonvegetated stringer.

Isolated stringers must be 35 m wide and .4 hectare in size to be classed separately from surrounding land classes. There must be a contiguous area .4 hectare in size that is 35 m wide (see figure below).



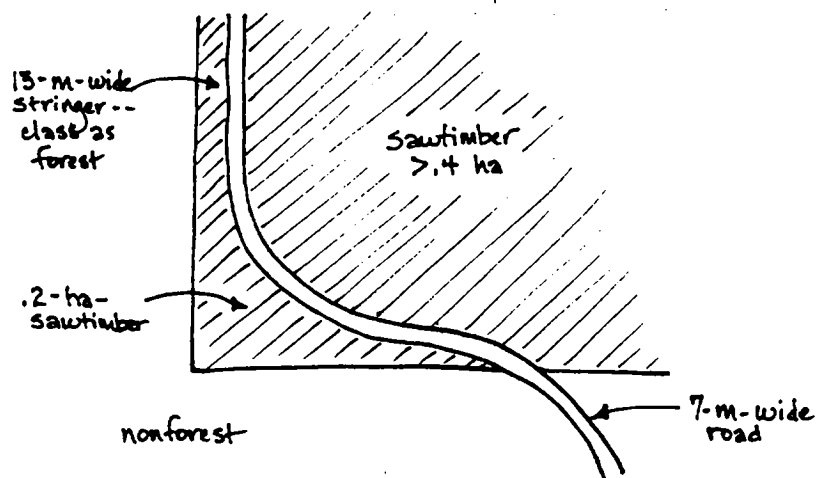
e.) Intermingled vegetation or natural nonvegetated stringers.

When a plot is located in intermingled natural stringers, each less than 35 m wide, establish a forest plot, locating points as they fall. The plot tally will determine if the plot is forest or nonforest.



f.) Land class amputation by cultural nonforest stringers.

When a cultural nonforest stringer isolates a stringer of forest that is less than 35 meters wide from adjoining forest, class the isolated forest strip as forest if the adjoining forest on the other side of the stringer is 35+ meters wide and .4 hectare or larger. If the cultural nonforest stringer is 35+ meters, class the isolated strip as nonforest (see figure below).



5. Ground land class definitions and codes.

LAND CLASS DEFINITIONS

Nonforest (code 61-69 92) - Land not qualifying as forest land. Includes land that has never supported forest growth and land once forest land but now developed for nonforest use such as crops, pasture, residential areas, highways, airstrips, etc. Areas of water less than 16 hectares in size or less than 200 meters in width will also be classified as nonforest. Census water, areas of water larger than these, is excluded from the gross area of the inventory unit. Christmas tree farms are classed as nonforest. (Nonforest codes listed on p. 24)

Forest Land - Land which is, or has been, at least 10 percent stocked by trees (10 percent stocking is equated with 10 percent crown cover or 10% of normal yield table values). A tree is defined as a woody plant that commonly has an erect perennial stem or trunk at least 7.5 cm in diameter at breast height (1.37 meters) and a total height of at least 4 meters. (Ag. Handbook No. 541, 1979, ed., p. 3).

Timberland (codes 20) - Forest land that can grow continuous crops of trees, to industrial roundwood size, quality, and quantity. Industrial roundwood requires species that grow to size and quality adequate to produce lumber and other manufactured products (excluding fenceposts and fuelwood). Productive potential is at least 1.4 cubic meters/hectare/year (20 cubic ft/acre/year). This land class is characterized by its potential for restocking with industrial roundwood trees, artificially or otherwise.

Other Forest Land - Forest land that cannot produce successive crops of trees suitable for industrial roundwood. Other forest types consist of species of lower quality and form for industrial roundwood products. Areas which are currently covered by these species and which show evidence of having supported tree species of industrial roundwood quality before being denuded by fire and cutting are considered timberland.

Rocky (code 41) - (A) Forest land that produces tree species of industrial roundwood quality, but is unmanageable because it is steep, hazardous, and rocky; or is (B) predominantly nonstockable rock or bedrock, with trees growing in cracks and pockets.

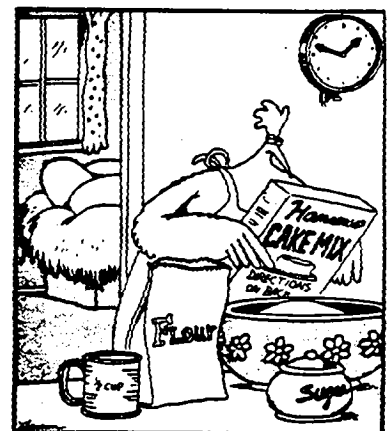
Oak-madrone (code 44) - Areas currently 10 percent or more stocked with forest trees, with low quality forest trees of oak, madrone, or other hardwood species predominating, and which are not now, and show no evidence of ever having been, 10 percent or more stocked with trees of industrial roundwood form and quality. Trees on these sites are usually short, slow growing, gnarled, poorly formed, and generally suitable only for fuelwood.

Unsuitable site (code 46) - Areas which are unsuitable for growing industrial wood because of environmental factors such as high water tables or coastal climatic conditions. Included be willow bogs, spruce bogs and stunted windswept shore pine. Area is currently 10 percent or more stocked with these trees.

IV. PLOT REFERENCING AND LAYOUT

TABLE OF CONTENTS

	PAGE
IV. PLOT REFERENCING AND LAYOUT	32
Referencing the plot	33
Reference point (RP)	33
Point-of-departure (POD)	34
Referencing point 1	34
Referencing all other points	36
Plot layout	37
Objectives	37
OCC3 plot layouts	37
Standard 5-point layout	39
1-point other forest	39
Point numbering	40
Rules for moving and substituting points.	40
How to move or substitute points	41
Examples of moved and substituted points	45



IV. PLOT REFERENCING AND LAYOUT

A. Referencing the plot. Reference all plots you measure on the ground (sample kinds 1 - 8).

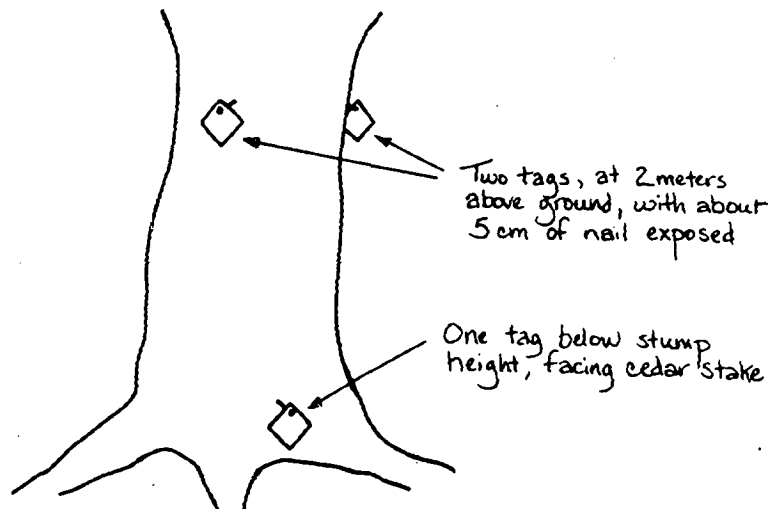
1. The point-of-departure (POD), reference point (RP), and location description. For every plot measured on the ground, an RP must be selected, and the section on the plot attribute record labeled "location description" must be completed. You may also select and label a point-of-departure (POD) if you feel it would provide useful additional information for relocating the plot.

a.) The reference point (RP). The RP is an object (usually a tree) that can be located on the ground and identified on the photo, and that will be useful for plot relocation in future inventories.

(1) Selecting an RP : The RP should be distinctive on both the ground and on the OCC 3 photos. On remeasurement plots, you may reuse the OCC 2 RP tree if it is suitable. If the old RP tree is dead, missing, or difficult to identify on the ground or on the plot photo, select a new RP. If possible, it should be a tree which is not likely to die or be cut before the next inventory. You may select a snag or other object for an RP (e.g., a distinctive fence post, building corner, telephone pole, etc.). If you use such an object, describe it on the plot photo and plot attribute record.

(2) Marking the RP tree. Mark the RP tree, whether tags are reused or new (see figure below). Nail aluminum plot tags on two or more sides of the RP tree, 2 meters above ground line, facing directions you expect future crews to approach the RP. Also nail an aluminum plot tag on the RP tree below stump height, on the side of the tree facing point 1. When attaching the tags, drive nails into the tree at an upward angle and always leave at least 5 centimeters of nail exposed.

(3) Pinpricking the RP tree location. Pinprick the RP on the OCC 3 photos (UNLESS the RP pinprick would be less than 2-3 mm from the point 1 pinprick). Using a pencil, circle the RP pinprick on the back of the photo and write "RP" and the plot number near the circle (but not too close to the pinprick!).



(4) Recording the RP tree data. Record the species, dbh (to the nearest cm), azimuth, and slope distance (to the nearest meter from RP to point 1) under "plot reference" on the plot attribute record.

In the "location description" section on the plot attribute record, record any information that would facilitate relocating the plot. Describe the point 1 location in terms of features that are unlikely to change before the next remeasurement. Include such items as slope, aspect, topographic position, and prominent features. In short, record observations in a way that will be of the most help to the OCC 4 field crew.

b.) The point-of-departure (POD) (optional). On one of the OCC 3 photos, pinprick your point-of-departure (POD). This is the spot where you leave the established road and begin traveling cross-country. Circle the pinprick in pencil on the back of the photo and mark the circle "POD" on the photo back. Select a POD and route of travel that will facilitate relocating the plot. For this reason, it is better to pinprick the POD after the plot has been located and you have familiarized yourself with the area.

In the "location description" section on the plot attribute record, describe how you reached the plot from the POD. Explain your route in terms of azimuth traveled; whether you walked uphill, downhill, or on the contour; any recognizable physiographical features (e.g. streams, rock outcrops, benches) you passed along the way. If any new roads have been built in the plot area since the date of the OCC 3 photos, sketch them on the photos if it will help the OCC 4 field crew relocate the plot.

B. Referencing point 1.

1. Pinpricking the point 1 location. The OCC 3 photos will have the point 1 location pinpricked in the office. When you arrive at point 1 on the ground, compare that location to the pinprick on the OCC 3 photos. If the pinprick is close to the actual ground location, in the same type, and is usable for finding the plot again, mark "Y" at "PINPRICK CORRECT?" under Interactive Items on the plot attribute record. If the pinprick is not in the same type as the ground location, or the pinprick is greater than 2 mm photo distance from the correct ground location (or not usable for finding the plot again), pinprick the correct location, circle "N" at "PINPRICK CORRECT?", and put your initials after "corrected by:". If the original pinprick is possibly in a different type than the corrected pinprick, circle "Y" at "pnt. NEEDS RE-P.I.?". If the corrected pinprick is in the same type as the original pinprick, circle "N" at "pnt. NEEDS RE-P.I.?". See "Pinprick Correct?" p. 60.

Mark the plot's point 1 location on the back of the photos. Use a pencil to circle the pinprick and write PC (for "plot center") and the plot number near the circle. In addition, if the pinprick was corrected write "corrected location" and your initials.

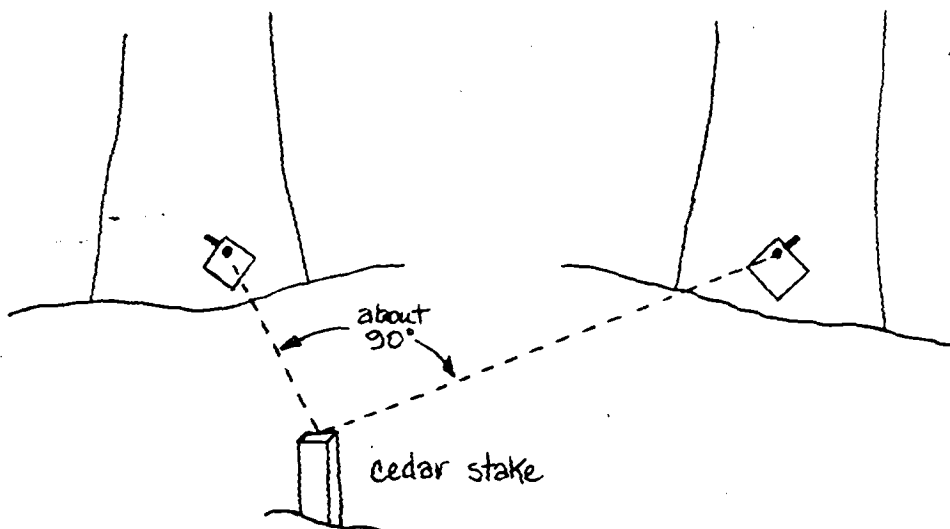
2. Referencing the point 1 location.

a.) Pound a cedar stake in the ground at the pinprick location. On remeasurement and walk-through plots (sample kind 1,2 & 7), replace the old cedar stake with a new one if the wood is no longer sound.

b.) Select two trees near the stake that form, as close as available, a right angle with the stake and each other. If the OCC 2 references for point 1 meet this criterion, reuse them. If you select new point 1 references, remove the square tags from the OCC 2 references to avoid confusing the OCC 4 crew. Trees within 2 meters of the stake are preferable. If trees are not available, you may use stumps.

c.) Nail a square aluminum tag below stump height on each tree on the side facing the stake at point center. Leave at least 5 cm of the nail exposed. If the trees are also numbered tally trees, attach the tree number tags with the same nails.

d.) In two locations on each reference tree, nail a round disc 2 meters high facing likely approaches to the point. (Remove any previously-affixed high rounds if you are not reusing the tree as a reference.)



C. Referencing all other points. Reference all points that are part of the plot (all OCC 3 BAF 7M prism points). Use the following instructions:

1. Marking point center. Mark the point center with a metal pin and round.
2. Selecting reference trees. Select 2 trees near the pin that form, as close as available, a right angle with the pin and each other. Trees within 2 meters of the pin are preferred. If trees are not available, you may use stumps. On new/remasurement points, be sure to either use the previous references, or if there are now better ones available, use new references and remove the round tags (both high and low) from the old references.
3. Marking reference trees.
 - a.) Tally trees. Nail an aluminum round to each reference tree, 2 meters above ground line, facing the direction you expect future crews to approach the point. If the tree is not a numbered tree, also nail an aluminum round below stump height, facing point center.
 - b.) Non-tally trees. Follow the instructions for tally trees. Always use a round below stump height.
4. Recording reference trees.
 - a.) Tally trees. If the reference trees are tally trees, code "9" in the remarks column of the tree tally line in the Husky data recorder, or type "reference".
 - b.) Non-tally trees. If the reference trees are not tally trees, complete a line for each in the Husky data recorder, with the following required information:
 - (1) Tree History = "9"
 - (2) Species code (see p. 93)
 - (3) Dbh (to the nearest cm)
 - (4) Azimuth (to the nearest degree, from pin to tag).
 - (5) Distance (slope distance, to the nearest cm)

D. Plot layout.

1. Objectives. The plot layout is designed to meet several objectives:

- a.) sample a manageable resource area
- b.) remeasure trees to provide information on change (growth, mortality, and cut)
- c.) use a cluster design so variability of stocking within the stand can be assessed
- d.) maintain inventory efficiency by minimizing the total number of sample points in this cluster
- e.) systematically sample the plot area
- f.) sample within the same land class, owner class, and stand condition in order to produce reasonable plot averages.

2. OCC 3 plot layouts.

OCC 3 plot layout is related to sample kind (plot attribute Item 3):

<u>Sample kind</u>	<u>OCC3 GLC</u>	<u>Plot Layout</u>
1	20	5-point remeasurement w/S-pts.
2	20	5-point remeasurement no S-pts.
3	20	5-point reconstructed w/S-pts.
4	20	5-point reconstructed no S-pts.
5	20	5-point new plot w/S-pts.
6	20	5-point new plot no S-pts.
7	20	5-point walk-through
8	41,44,46	1-point new (veg. profile only).
9	60s	nonforest plot (classification only)

In most cases we are remeasuring 5-point plots established at OCC2. On remeasurement plots (SK 1,2 and 7), accept the OCC2 plot layout unless there has been a real disturbance to the plot (see discussion on moving and substituting points on remeasurement plots). Plots are screened in the office for changes on the ground since OCC2 that may affect plot layout.

New plots (SK 5,6) are also screened in the office for conditions affecting plot layout. General instructions are recorded in the Interactive Items on the plot attribute record for laying out the OCC3 plot. Follow these instructions unless you encounter a situation which the screener was clearly unaware (e.g. harvesting in the plot area since OCC3 photography).

Lost plots (reconstructed plots) SK 3,4 are laid out using the same guidelines the plot screener used in reviewing new plots, and used by the OCC2 crews in establishing 5-point plots for the first time. These objectives and guidelines follow.

For all plots, the point 1 location is the permanent photo and map identification point used to determine the plot's land class and stand condition. Objectives of plot layout are to keep all points:

- (1) in the same land class (.4 hectare minimum) as the pinpricked location. (Points are substituted in order to keep the plot in the same land class).
- (2) in the same stand condition (3.0 hectare minimum) as the pinpricked location. (see definitions below) Points are substituted in order to keep the plot in the same stand condition.
- (3) in the inventory sample area (does not include National Forest lands, reserved areas, or census water). Points are substituted to keep the plot in the inventory sample area.
- (4) in the same owner class (same wording as in (5)).
- (5) at least 17 meters from any of the above boundaries. (On remeasurement plots (SK 1,2,7), points are moved only if the OCC2 tally is affected).

Stand condition for new and reconstructed plots (SK 3,4,5,6) is defined by physioclass, broad forest type, size class, and stand density. Recognize boundaries between stand conditions only if they are distinct. Ignore boundaries between land classes or stand conditions that are transitional and difficult to recognize on the ground. The following are examples of contrasting stand conditions.

Physioclass. Slope, aspect, and land form can affect forest type, stand density or treatment options. The following are examples of physioclass types that could be considered different stand conditions:

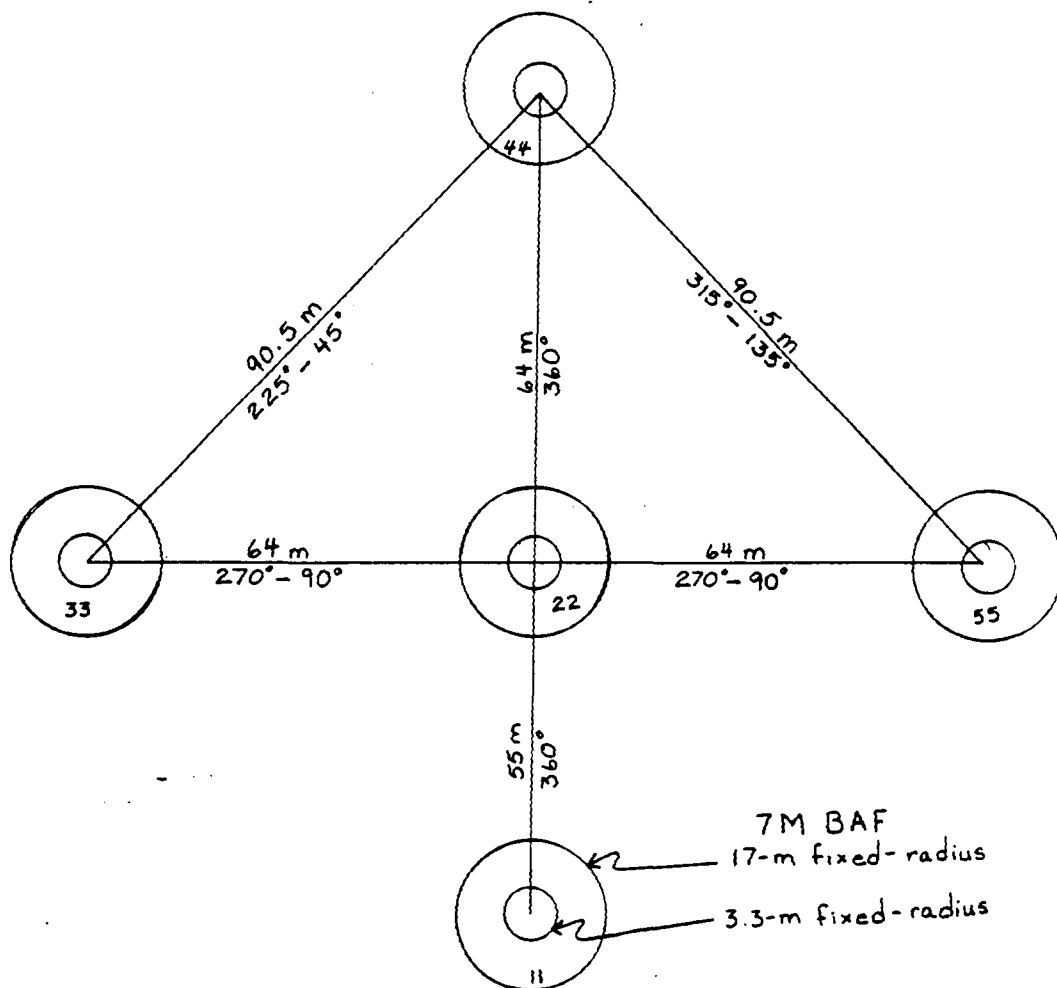
- 1) steep north slope vs. steep south slope.
- 2) swampy flat vs. well-drained side hill.
- 3) deep-soiled flat (plateau, bench, river bottom) vs. steep, thin-soiled side hill.

Broad forest type. Pure hardwood types, pure conifer types, mixed hardwood-conifer types, and brush are different stand conditions.

Size class. Areas of large trees (large pole or sawtimber), small trees (seed/sap), and nonstocked stands are different stand conditions.

Stand density. Areas of high density (75-100 percent crown closure), medium density (25-74 percent), and low density (0-25 percent crown closure). Areas of high density and low density are different stand conditions.

3.) Standard 5-point layout: On remeasurement and walk-through plots (sample kind 1,2,7), OCC3 points coincide with OCC2 points. New and reconstructed plots (SK 3,4,5,6) are laid out using the standard 5-point design.



4.) 1-point other forest (sample kind 8). Establish a one point plot at point N1 (the pinpricked location).

5. Point numbering.

a.) N/R points (sample kinds 1,2 and 7 plots where OCC 2 and OCC 3 points coincide). The first digit is the OCC 2 point number, the second digit is the OCC 3 point number.

b.) N points (points that are new or reconstructed at OCC3). Points not found ("lost" points) are N points. Sample kind 1,2 and 7 plots will have N points where OCC2 points are moved, substituted or lost. N points are reconstructed.

c.) S-points (stocking only points). Sample kinds 1,3 & 5 will always have stocking only points.

VALID NUMBERS OF POINTS BY KIND OF POINT AND SAMPLE KIND WESTERN WASHINGTON 3/15/88

SAMPLE KIND	KIND OF POINT			
	N/R	N	N+N/R	S
1	0-5	0-5	5	5
2	0-5	0-5	5	0
3	0	5	5	5
4	0	5	5	0
5	0	5	5	5
6	0	5	5	0
7	0-5	0-5	5	0
8	0	1	1	0
9	0	0	0	0

6. Rules for moving and substituting points.

Purpose: The purpose for moving or substituting a point is to ensure that the entire plot is in the inventory unit and samples the same land class, stand position, and owner class as point 1. On full remeasurement and walk-through plots, we want to retain as much of the OCC2 plot as possible for change analysis.

a.) Remeasured plots (SK 1,2,7): Never substitute point 1! Move point 1 only when part of the tally has been removed by clearcutting, thereby placing the point in two stand conditions--cut and uncut; or when part of the tally or part of the 3.3-meter fixed-radius plot (but not the center stake) has been lost to a road or other nonforest type, or falls outside the inventory unit (e.g. National Forest). Move or substitute points 2-5 if, because of clearcutting, land use change, or change in ownership status, part or all of the point is in a different stand condition, land use class, or is outside the inventory unit, and tree tally or part of the 3.3-meter fixed-radius plot has been lost as a result. If the point center is in the inventory unit and the same condition class as point 1, the point should be moved. If the point center is outside the inventory unit or in a different stand condition class than point 1, the point should be substituted.

b.) New or reconstructed plots (sample kinds 3,4,5,6): New or reconstructed plots should never straddle land use or major ownership class boundaries (forest industry, farm and miscellaneous, other public) or fall partly in National Forest or Reserved areas. In addition, plots should be placed entirely within a single stand condition, as defined on p. 42. A stand condition must by definition be at least 3 hectares in size to be recognized. Combine smaller types until the minimum size is reached. Recognize stand boundaries only when they are distinct and obvious. Ignore differences that are vague and indistinct.

When necessary to meet the above conditions, move or substitute points. Point 1 must never be substituted but should be moved if (1) the 17-meter fixed-radius plot falls in two distinct conditions as defined above or (2) point 1 falls in a narrow neck of the condition that is less than 35 meters wide but adjacent to a wider part of the condition.

Point 2-5 should be moved if the point falls in the same stand condition as point 1 but part of the 17-meter fixed-radius plot falls in a contrasting condition. Points 2-5 should be substituted if the point center falls in a different stand condition than point 1.

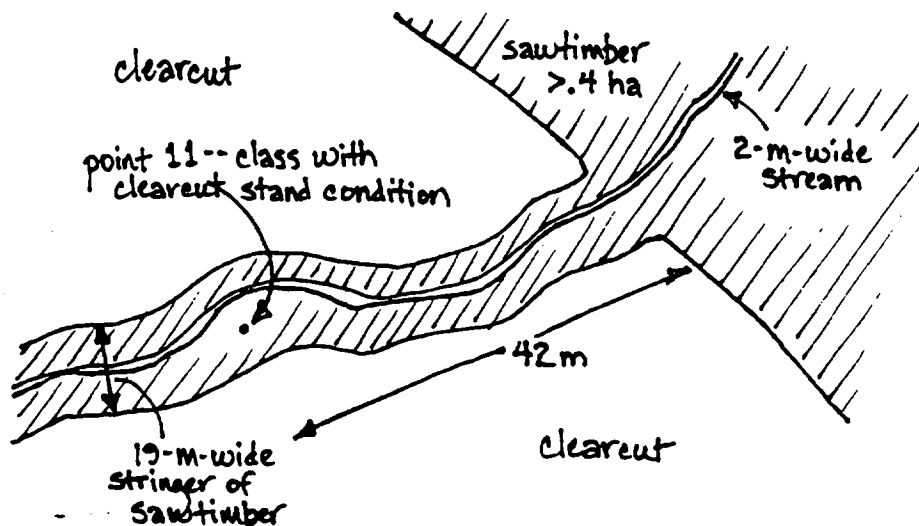
c.) "Lost points". If a point cannot be found, install a new point (N point) in the same location; the N point must be reconstructed.

7. How to move or substitute points:

a.) Moving point 1. If point 1 must be moved (see previous guidelines), follow these steps:

- (1) Reference the pinpricked location as usual with a cedar stake and two reference trees (see p. 35).

(2) Move to a location that is 17 meters from boundaries with different land classes and stand conditions; measure distance horizontally in the direction that will minimize the distance moved. If the point falls in a narrow neck of the type (less than 35 meters wide), move the point towards the wider part of the type island, just far enough to bring the entire 17 meter fixed-radius plot inside the type. Do not move more than 35 meters unless the point must be moved across a nonforest road less than 35 meters wide. If you must cross a road, you may move the point 35 meters plus the width of the road. If, after moving 35 meters, the 17 meter fixed-radius plot is still not within the type, return to the original pinpricked location and combine the type with the most similar adjacent type. If the adjacent type is nonforest, classify the plot as nonforest. See the following illustration.



Point 11 falls in 19-m-wide stringer of sawtimber that is greater than 35 m from the large area of sawtimber. Point 11 therefore cannot be moved and is classed with the adjoining stand condition (clearcut).

(3) In the "point moved" section on the plot attribute record, record the azimuth and distance (to the nearest decimeter) from the cedar stake to the new point 1 (point number N1).

(4) Reference and tally point N1 as usual.

c. Moving points 2 - 5. Move and reference points 2 - 5 as follows:

- (1) Locate the point that must be moved (see previous diagram) (point A).
- (2) Move to a location (point B) that is 17 meters from the boundary; measure distance horizontally along a line that is perpendicular to the boundary.
- (3) In the "Point Moved" section on the plot attribute record, record the azimuth and distance (to the nearest decimeter) from point A to point B.
- (4) Reference and tally point B as usual.
- (5) Proceed to the next point from point A.

a. Substituting point 1. Do not substitute point 1. If point 1 cannot be moved 17 meters away from boundaries with other stand conditions according to the rules on p. 38, the point is then classified like the surrounding area (see diagram on p. 46).

b. Substituting points 2-5. Follow these steps when substituting pts. 2-5:

- (1) Establish all points that can be located in their standard positions.
- (2) Go to the established point with the highest point number that is located in a standard position, and locate substitute points from there.
- (3) Using the following table, establish the substitute point at the first location that (1) is in the same land class, stand condition, and owner class as point 1; (2) is at least 35 meters from all other points; and (3) does not coincide with another point.

<u>Azimuth</u>	<u>Distance</u>
360	64 m
45	90.5 m
90	64 m
135	90.5 m
180	64 m
225	90.5 m
270	64 m
315	90.5 m

If more than one point needs to be substituted, substitute the one with the lowest point number first. Then follow steps (1) through (3) to locate the other point(s).

If you cannot locate substitute points from the highest numbered point in a standard position, go to the next highest numbered point in a standard position and repeat step (3) above.

If you have tried to locate substitute points off established points without success, go to the highest numbered substitute point and begin again. Continue the process until all 5 points have been established.

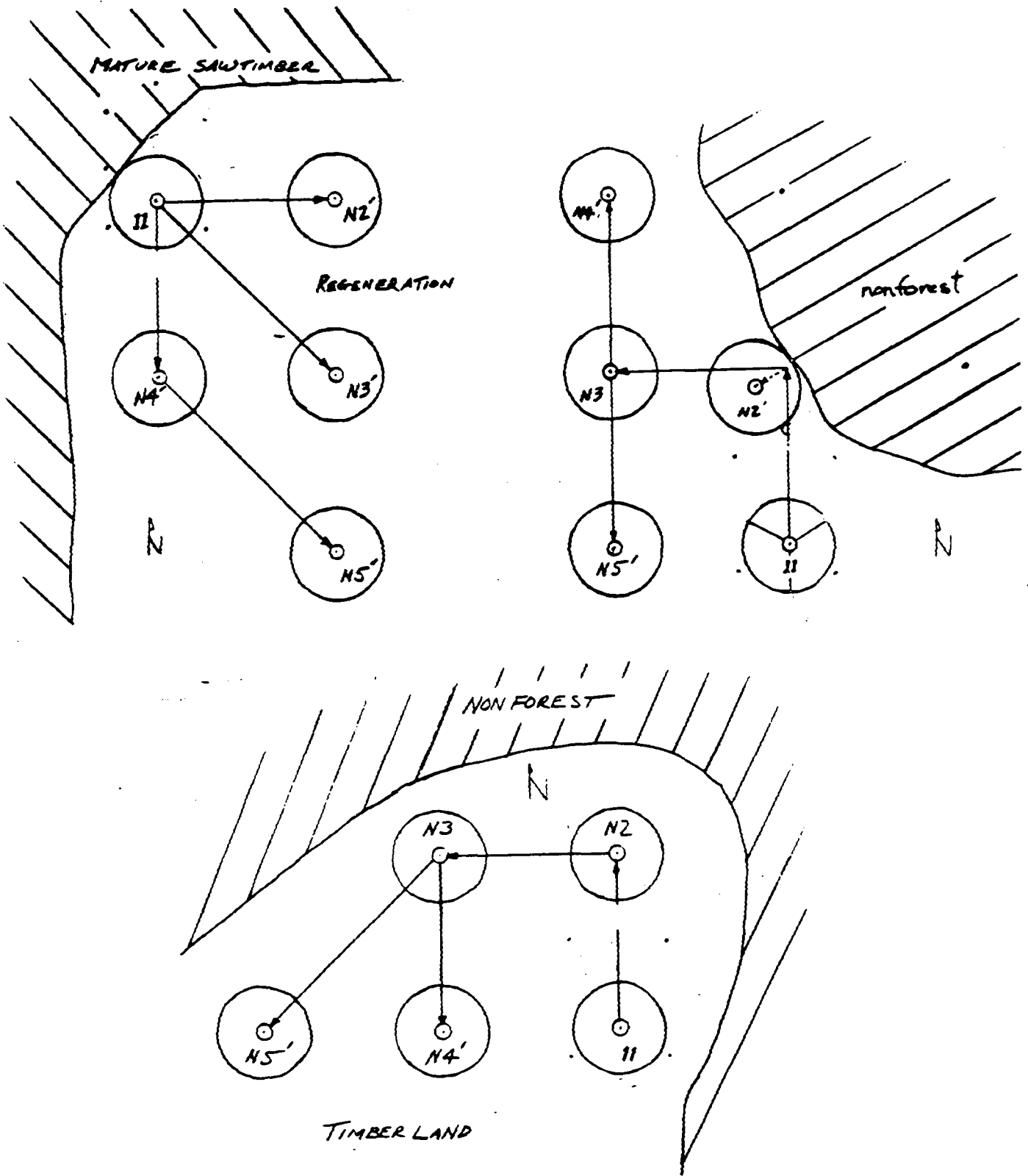
c. Substituting points in small areas. Where the area is too small for substituting points using the standard distance between points, use the following steps:

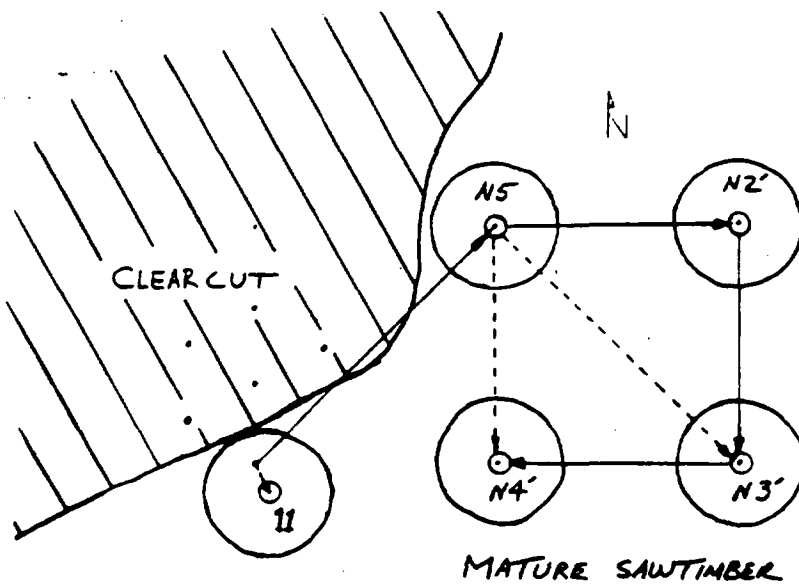
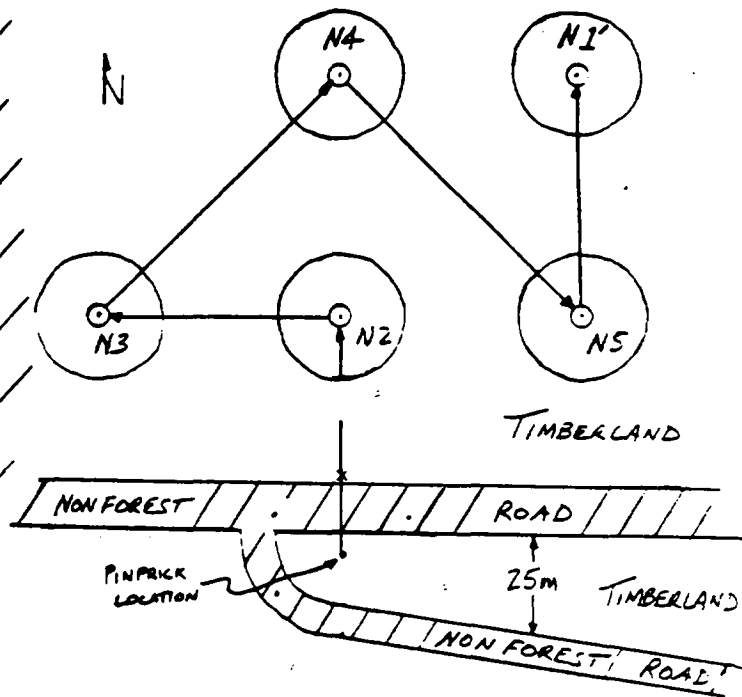
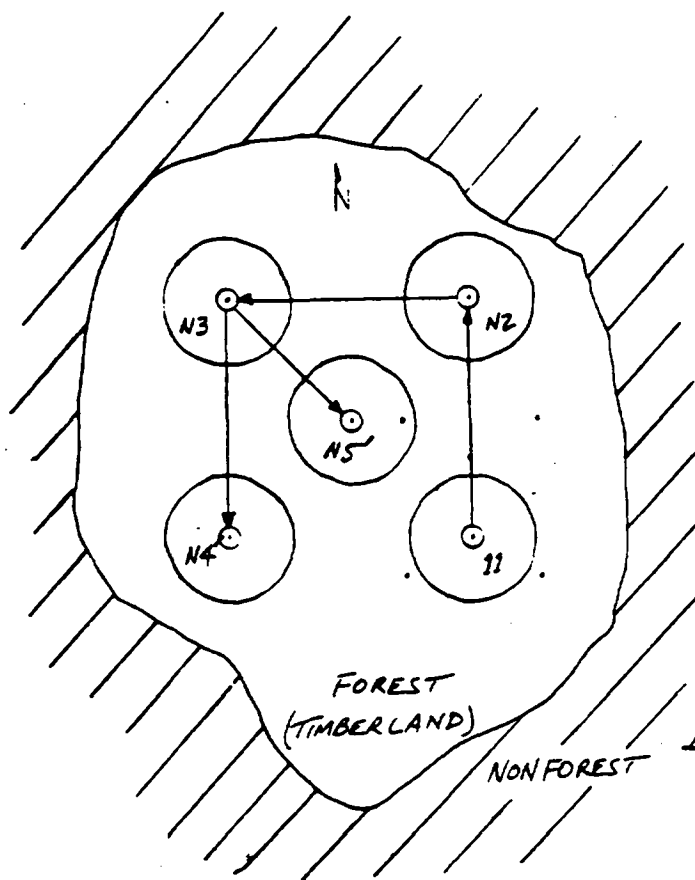
(1) Establish as many substitute points as possible using the procedures outlined above.

(2) Go to the highest numbered point that is in a standard location.

(3) Locate points from here, using the standard azimuths but only half the standard distances for point substitution.

8. Examples of moved and substituted points.





V. PLOT AREA CLASSIFICATION

TABLE OF CONTENTS

	PAGE
V. PLOT AREA CLASSIFICATION	47
Plot area classification items	48
Item 11--Precipitation	48
Item 12--Elevation	48
Item 13--Plant Association	49
Item 14--Stand condition	52
Plot physioclass items	53
Item 15--Plot aspect	53
Item 16--Plot slope.	53
Item 17--Type of logging	53
Item 18--Soil depth	53
Item 19--Kind of harvest since OCC 2	54
Item 20--Kind of harvest before OCC 2	55
Item 21--Date of harvest since OCC 2	55
Item 22--Date of harvest before OCC 2	55
Item 23--Silvicultural treatment OCC 2	56
Item 24--Treatment Opportunity	57
Item 25--Hardwood site	58
Numbers of points measured at OCC 3	58
Item 26--# N/R	58
Item 27--# N	58
Interactive Items.	59
Crew identification	59
OCC 3 plot layout	59
Present condition/Past disturbance	59
Field check item	59
Contact office about	59
OCC2 GLC_Correct?	59
Pinprick correct?	59
Owner response	61
Owner class correct?	61
Site index data	61
Plot Site Index	62
Objective	62
Tree selection	62
Gener rules for selecting site trees	62
King's method for selecting D-fir & w. hemlock	62
Data recording	64
Site Tree Data Flow	65

V. PLOT AREA CLASSIFICATION

A. Plot area classification items. The plot area classification items are recorded on the plot attribute record. Refer to the guide below to determine which area classification items to complete.

REQUIRED FIELD CREW TALLY FOR THE PLOT ATTRIBUTE RECORD

<u>Sample Kind</u>	<u>OCC3 GLC</u>	<u>Data needed for these items:</u>
1,2,3,4,7 (full remeasurement, reconstructed, & walkthru)	20	1-10; 11,13, 15-27
5,6 (new)	20	1-5,7,10; 11-13, 15-27
8 (other forest*)	40s	1-10; 11-23,25-27
9 (nonforest*)	60s,92	1-9

* New-to-inventory plots will not have OCC2 data items completed.

1. Item 11--Precipitation. 3-digit code printed on the plot attribute record, shows average annual precipitation in centimeters. Do not change the printed code.

2. Item 12--Elevation. 4-digit code printed on the plot attribute record, shows the plot's elevation to the nearest dekameter. Do not change the printed code. The plot's elevation is determined by direct inspection of the USGS quadrangle maps. Information on elevation is useful for describing a plot's stockability and its potential use as wildlife habitat.

3. Item 13--Plant Association. 6-digit code describing the predominant plant association on the site. The first two digits describe the climax overstory species - the species that is generally found in the reproduction; code for all forest plots. The third and fourth digits are the series; code for all GLC 20 plots. The last two digits are not used for this inventory.

The following are the two-digit Association/Formation codes for all plots and two-digit series codes for timberland plots.

Administrative or Agricultural AX

AB Buildings, structures, roads
 AC Cultivated land
 AD Dump for trash, garbage, etc.
 AG Grassland, permanent pasture (improved pasture)
 AO Orchards
 AR Recreation areas, parks, play areas, golf courses

Coniferous Forest CX

CA Alpine fir, mountain hemlock, whitebark pine (open parks)
 CA D1 --no specific series
 CC Western redcedar
 CC D1 --no specific series
 CD Douglas-fir
 CD S6 Douglas-fir/ocean spray
 CE Alpine fir - Englemann spruce (closed forest)
 CE D1 --no specific series
 CF Silver fir, noble fir
 CF F1 Silver fir/twisted stalk, Oxalis
 CF F3 Silver fir/beargrass
 CF S1 Silver fir/Salal, Oregon grape
 CF S3 Silver fir/Devils Club
 CF S5 Silver fir/Alaska huckleberry
 CH Western hemlock
 CH F1 Western hemlock/Sword fern, Oxalis
 CH F4 Western hemlock/Sword fern
 CH H3 Western hemlock/Chinkapin
 CH S7 Western hemlock/Rhododendron, Salal
 CH S8 Western hemlock/Rhododendron, Oregon grape
 CL Lodgepole pine (climax or seral)
 CL D1 --no specific series
 CM Mountain hemlock
 CM S1 --no specific series
 CP Ponderosa, Jeffrey pine
 CP D1 --no specific series
 CS Sitka spruce
 CS S7 Sitka spruce/Salal, Deer fern
 CS S8 Sitka spruce/Devils Club, Lady fern
 CW White fir/grand fir
 CW P1 --no specific series

Forbland

FX

- FM Moist forblands in forest zone - includes bear grass (Xerophyllum),
buckwheat scab (Eriogonum), coastal lupine
FS Subalpine, alpine forb fields
FW Wet forblands, forb meadows - includes cow parsnip (Heracleum)
camos (Camassia)

Grassland

GX

- GA Annual grass vegetation - includes cheatgrass (Bromus tectorum),
soft chess (Bromus mollis), dogtain (Cynosirus)
GB Bunchgrass - includes bluegrass (Poa), needlegrass (Stipa),
squirreltail (Sitanion), wheatgrass (Agropyron), fescue (Festuca),
wildrye (Elymus)
GR Rhyzomatous grass or sedge vegetation - includes sedge (Carex),
blue gramma (Bouteloua)
GS Subalpine or alpine grassland

Hardwood Forest

HX

- HA Alder
HA D1 --no specific series
HB Bigleaf maple
HB D1 --no specific series
HC Cottonwood, ash, bottomland, overflow bottomland
HC D1 --no specific series
HM Madrone
HM D1 --no specific series
HO Oregon white oak, California black oak
HO D1 --no specific series
HQ Quaking aspen
HQ D1 --no specific series

Meadow

MX

- MD Dry meadow - water table available part of growing season
MM Moist meadow - water table available all growing season
MT Tule meadow - standing water most or all growing season;
includes bullrush (Scirpus), cat tail, waterlilly
MW Wet meadow - surface moist or wet most of growing season

Nonvegetated NX

NA Avalanche paths
NC Cinders, lava flow, mud flow, glacial wash
NF Flood plain periodically denuded of vegetation
NM Mine tailings, dredgings, man-caused minimal vegetation
NR Rocky land with minimal vegetation potential
NS Sand with minimal vegetation potential
NT Talus land with minimal vegetation potential

Shrubland SX

SC Chapparral, evergreen shrubland - other forest
SM Moist shrubland - other forest- includes sitka alder (Alnus
 sinuate), willow (Salix), coastal shrub
SS Subalpine and alpine shrub

Water WX

WL Lake, pond impoundment, nonmoving water
WR Running water - stream, river, creek, ditch

4. Item 14--Stand Condition (GLC 41,44,46). Record a 1-digit code, for all other forest plots that best describes the condition of the stand within the 17 m fixed-radius plot (same area for which the vegetation profile is collected). For plots of other GLCs, stand condition is calculated using tree tally data. Stages of development are the result of natural growth and development of plant communities following disturbance. Information on stage of development is used describing wildlife habitats. The codes are defined as follows:

<u>Code</u>	<u>Stand condition</u>	<u>Description</u>
1	grass-forb	Shrubs less than 40% crown cover and less than 1.5 m tall; plot may range from being largely devoid of vegetation to dominance by herbaceous species (grasses and forbs); tree regeneration generally less than 1.5 m tall and 40% cover.
2	shrub	Shrubs \geq 40% crown canopy of any height; trees less than 40% crown canopy and less than 2.5 cm dbh. When average stand diameter exceeds 2.5 cm, plot is "open sapling" or "closed sapling".
3	open sapling-pole	Average stand diameter 2.5-22.9 cm, and tree crown canopy less than 60%.
4	closed sapling, pole, sawtimber	Average stand diameter is 2.5-53.3 cm, and crown cover is 60% or greater.
5	open sawtimber	Average stand diameter is 23.0-53.3 cm; and crown cover is less than 60%.
6	large sawtimber	Average stand diameter exceeds 53.3 cm; crown cover may be less than 100%; decay and decadance required for old-growth characteristics is generally lacking, successional trees required by old-growth may be lacking, and dead and down material required by old-growth is lacking.
7	old-growth	Average stand diameter exceeds 53.3 cm. Stands over 200 years old with at least two tree layers (overstory and understory), decay in living trees snags, and down woody material. Some of the overstory layer may be composed of long-lived successional species (e.g. D.-fir, W. redcedar).

5. Plot physioclass items.

a. Item 15--Plot aspect. 2-digit code. Refer to the aspects recorded for individual points, to help you determine the plot average. Use the same coding system. If the aspect is equally SE, S, SW, code the aspect S. If the aspect is SE, S, SW, but 80 percent of the area is SE; code the aspect SE. For timberland plots, code the aspect which would most affect timber management.

b. Item 16--Plot slope. 2-digit code. Refer to the slope recorded for individual points to help determine the plot average. Use the same coding system. If the slope changes gradually from 20 to 60 percent, average the individual point slope percents. If slope ranges from 20 to 60 percent, but most of the plot area is on the steeper slope, code the steeper slope.

6. Item 17--Type of Logging. 1-digit code that describes the type of logging system used to harvest or convert the previous stand. This information is used to evaluate timber extraction costs.

CODE	TYPE OF LOGGING SYSTEM
1	Previous stand was removed using a cable system.
2	Previous stand was removed using crawler tractors, rubber-tire skidders, or mobile feller-brunchers.
3	Previous stand was removed, but the type of logging system is unknown.
4	Stand has never been harvested or converted.

If the previous stand was transported from the site using logging railroads, code the type of logging system as a "1".

7. Item 18--Soil depth. 1-digit code. Code this item "1" when more than 1/2 of the sample points (17 m fixed-radius plots) have shallow soil.

<u>CODE</u>	<u>SOIL DEPTH</u>
1	Less than 50 cm
2	50 cm or greater

9. Item 19--Kind of harvest since OCC 2. Record a 1-digit code describing harvesting since the OCC2 inventory. Apply the following logic:

Sample kind 1,2,7: Code for harvest only if one or more trees tallied live at OCC2 with an OCC2 dbh >12.5 cm are coded with a TH 8 at OCC3.

Sample kind 3,4,5,6: Code for harvest only if one or more trees reconstructed to have been tallied, live and >12.5 cm dbh at OCC2 are coded with a TH 8 at OCC3.

Sample kind 8: Code for harvesting if it occurred within 17m of point center.

<u>CODE</u>	<u>KIND OF HARVEST</u>
0	No harvest
1	Clearcut harvest
2	Partial harvest
3	Seed tree, shelterwood, or residual removal

Definitions:

In a clearcut harvest, residual trees of all sizes now comprise <25% cover. The residual trees usually include cull trees and less commercially desirable hardwoods. Do not code clearcut harvest if the OCC2 Management Type was 4, Stage of Development was 1 or 0, or Treatment was 02 (See Item 24, p. 57). The appropriate Kind of Harvest for such stands is code 3 --residual removal.

In a partial harvest, remaining trees comprise \geq 25% cover and at least 20% of the manageable stand was removed. In this type of harvest the residual stand usually consists of commercially desirable trees. In seed tree and shelterwood cuts, which are included in this category, the residual trees are conifers that were left to regenerate a new stand. This category does not include final seed tree removals or shelterwood removals. This category does not include removals of incidental trees where <20% of the stand was harvested, such as firewood cutting--code "3" residual removal.

A seed tree, shelterwood, or residual removal. Harvest of residual sawtimber trees in a regeneration or nonstocked stand. Include final salvage cuts (removals of residual trees left after clearcut harvests).

This item aids users of FIA data to track the history of stand development. It is used in timber supply projections, and it provides information for harvest studies.

Also add the following "kind of harvest" codes and definitions:

Code Kind of harvest

4 Firewood and local use

5 Incidental harvest

Definitions:

Seed tree, shelterwood, or residual removal (no change from current wording--do NOT include firewood, local use, or incidental removals here).

Firewood and local use includes trees cut down and used locally, not hauled away to the mill on a log truck.

Incidental harvest includes cut trees not qualifying as any of (1)-(4) above. Includes removal of occasional trees for unknown purposes, or as part of operation to adjacent stand that only affected one or a few trees on the plot.

10. Item 20--Kind of harvest before OCC 2. 1-digit code, printed by the computer. It indicates the type of most recent harvesting activity recorded by the field crew in the previous inventory. Codes are defined in Item 19. Update the printed code if it can be determined that the previous crew miscoded the item. For sample kinds 3,4,5,6 plots, record if cut before 1978.

11. Item 21--Date of harvest since OCC 2. If a 1,2 or 3 was coded in Item 19, record a 2-digit code stating the year of the harvest activity that occurred since OCC 2. A harvest in 1981 is coded 81. If a zero was recorded in Item 18, enter nothing for this item. For new and reconstructed plots (sample kind 3,4,5 & 6) estimate age of cutting, and record here if harvested since 1978.

On plots with harvest since OCC2, rely on the best available information in determining the date of harvest. When visiting a plot on which harvesting has occurred, the freshness of stumps, slash and degree of revegetation are indicators of date of harvest. In clearcuts, the age of the regeneration stand may provide a "yardstick" to date the harvest, but remember to account for the time elapsed between harvest and planting. In partial cuts, one can estimate date of harvest by boring residual trees in order to count the number of rings since release; this technique may also be applied to clearcuts by boring trees located in adjacent stands that are on the clearcut boundary. When dating by boring, consider whether to add an extra year (or years) as release often is not evident in the first year following harvest.

Do not make a separate job out of acquiring this info. Crew will continue to record date of harvest as accurately as possible based on whatever info is available to them.

If the date is confirmed, record an asterisk (*) on the plot attribute record after the "date of harvest".

12. Item 22--Date of harvest before OCC 2. 2-digit code, printed by the computer. It indicates the year of most recent harvesting, as determined by the field crew in the OCC 2 inventory. Update the printed code if it can be determined that the previous crew miscoded the item or "???" is printed on the plot attribute record. Some plots in Western Washington may have been harvested as late as 1979 and still have been cut before the plot was established. On sample kind 3,4,5 & 6 plots, estimate age of cutting and record here if before 1978. Acceptable codes are 00 - 78. Code 01 for cutting in the 19th century.

13. Item 23--Silvicultural treatment since OCC 2. Record a 2-digit code that describes silvicultural treatments occurring since the OCC2 inventory. Code only for activities that have occurred within 17 meters of N or N/R points. Use combinations of codes to record multiple treatments. For example: 35 or 53= site preparation and planting of "holes".

<u>CODE</u>	<u>KIND OF CULTURAL ACTIVITY</u>
00	No treatment
01	Planting
02	Plant holes
03	Precommercial thin
04	Site preparation
05	Clean and release
06	Underplant
07	Improvement cut
08	Stand conversion

Definitions of silvicultural treatments:

Planting. Planting the area with desirable growing stock.

Plant holes. Spot planting of nonstocked holes.

Precommercial thin. An intermediate harvest in which excess growing stock are removed and are not sold.

Site preparation. Removal of young hardwoods, brush, ferns slash, and other inhibiting materials. Soil may be furrowed.

Clean and release. Removal or killing of undesirable species of vegetation (usually brush or hardwoods).

Underplant. Planting under a sawtimber overstory.

Improvement cut. The removal of unsalable material in order to free crop trees from competition. Improvement cutting differs from a commercial thinning in that the material removed is not marketable.

Stand conversion. Removal of unmarketable trees (primarily hardwoods) in order to plant the area with desirable growing stock.

14. Item 24--Treatment Opportunity at OCC2. 4 digit code, printed by the computer. Do not change the printed code. This item indicates the opportunity for silvicultural treatment that was identified at OCC2. This information is printed for office use. Codes and treatment definitions follow.

<u>First digit</u>	<u>Management Type</u>
1	Conifer
2	High-value hardwood
3	Mixed (conifer and high-value hardwood)
4	Management stand absent
<u>Second digit</u>	<u>Stage of development</u>
1	Regeneration
2	Intermediate
3	Mature
0	Used with "management stand absent"
<u>3rd and 4th digits</u>	<u>Treatment</u>
01	No treatment
02	Site preparation and planting
03	Site preparation and plant holes
04	Precommercial thin
05	Precommercial thin clumps
06	Clean and release
07	Commercial thin
08	Improvement cut
09	Sanitation salvage
10	Regeneration harvest
11	Shelterwood seed cut
12	Shelterwood removal cut
13	Recent shelterwood seed cut (no regeneration)
14	Underplant
15	Stand conversion
16	Recent clearcut (no regeneration)
17	Recent clearcut (partial regeneration)
18	Plant
38	Improvement cut/site preparation and plant holes
48	Improvement cut/precommercial thin
58	Improvement cut/precommercial thin clumps
68	Improvement cut/clean and release
78	Improvement cut/underplant
99	Marginal site (determined by analyst)

15. Item 25--Hardwood site. 1-digit code printed by the computer. Do not change the printed code. If it is questionable, note so under "Contact Office About" on the plot attribute record and alert the field coordinator. Plot of hardwood site "1" must also be coded with a hardwood plant association code. Hardwood plant association must be coded hardwood site "1".

<u>Code</u>	<u>Condition</u>
-------------	------------------

- | | |
|---|---|
| 1 | Plot is timberland that is a hardwood site incapable of growing a manageable conifer stand. Examples: cottonwood flats along streams; Oregon ash stands on low, wet ground. |
| 0 | Plot is any other condition. |

Plots on hardwood sites are handled differently in timber supply projections, and in classification of treatment opportunity. Because this item indicates the potential vegetation of an area, it is also useful for classifying wildlife habitat, and studying hardwood resources.

16. Number of points measured at OCC 3. Information on the number of points is used in data processing.

a. Item 26--# N/R =. Record a 1-digit code (1-5) indicating the number of new/remeasured points measured at OCC 3.

b. Item 27--# N =. Record a 1-digit code (1-5) indicating the number of new sample points measured at OCC 3.

B. Interactive Items.

1. Crew identification: Estimator--Recorder--Date. Record each crew member's name, and the date the plot was completed.

2. OCC 3 Plot Layout. Show locations and numbers of sample points; any significant features (e.g. drainages, rock outcrops, other items that may help future crews relocate the plot); any stand conditions or land classes that affected plot layout (i.e. show reasons for moved and substituted points). Label north direction. Plot layout diagram is also used to analyze plot conditions.

3. Present condition/Past disturbance. Provide general information about the plot area, such as: stand age, species composition, stand history (cutting and other disturbances such as fire, flooding, wind, mining, grazing, home-building, recreational development), stocking, understory, recommended treatments. Note anything unique or unusual about the area. In addition, discuss any questions regarding land class, site index questions, explanations for number of site trees taken, plot layout, disease or other impacts, harvest, silvicultural treatment (if the treatment occurs on less than all five points, note the point numbers, and describe the types). In discussing any changes in how the plot area is classified (e.g. changes in land class, stand history, stand impacts, etc., that are due to a road, management activity, etc.), note whether the change is a real change since OCC 2, or a pre-existing condition that was misclassified at OCC 2. Also indicate the item in "Contact Office About".

While some of this information is coded elsewhere on the data sheets, this narrative provides valuable additional information that can enable an analyst to better understand the area.

4. Field Check Item: This is an office entered item to alert the field crew for any classification questions, information needs, or any specific requirements for collecting information from the plot.

5. Contact Office About: This is a field entered item. Make note of any items you feel should be reviewed or resolved by the field coordinator or by office personnel before the plot is processed. Change must be noted for GLC, FLS, owner class or re-PI at either occasion.

6. OCC2 GLC correct? This is a field-entered item that is used in updating OCC2 GLC on the plot file. Circle "NO" if you disagree with the OCC2 GLC classification and note the reason.

7. Pinprick Correct? Transferring pinprick locations in the office from old to new photos is sometimes difficult. We occasionally find plots with pinprick locations that are inconsistent between inventories. Crews may also find the OCC 3 pinprick in error. Regardless of how you record this item, make sure the pinprick location on the OCC 3 photos is at the true ground location of point 1.

a.) Pinprick correct? Circle the "Y" or "N," indicating whether the OCC 2 pinprick locations agree with the plot's location on the ground and with the OCC 3 pinprick.

Code

- Y OCC 2, and 3 pinpricks agree with the plot's ground location.
- N OCC 2, and 3 pinpricks do not agree with the plot's ground location.

b.) If N. If you circled "N", change the incorrectly pinpricked locations on the OCC 2, or OCC 3 plot photos to agree with the true ground location. Initial and date the space provided to indicate you have done so, and note in "Other Additional Info." which photos were re-pinpricked. NOTE: Do not repinprick the OCC 3 photos if the plot remains in the same stand condition and photo distance is less than 1-2 mm away from the true location. (see page 34--pinpricking photos)

c.) Does point need re-p.i.? If the OCC 3 pinprick location (pinpricked in the office by highly skilled technicians & professionals) was not at the correct ground location, the field crew must determine whether the pinprick location, photo interpreted in the office, is in a different stand condition than the corrected ground location. Should the photos need re-PI, note in "Contact Office About" on the plot attribute record.

Code

- Y The corrected on-the-ground pinprick location is not in the same stand condition as the office pinpricked location. (See page 38 for definition of stand condition.)
- N The pinprick locations are in the same stand condition.

8. Owner Response: This is an office entered item to inform the field crew of the status of landowner contact for the plot. All miscellaneous private owners were sent an informative letter of intent before the field season. If the landowner has responded to the letter by returning the post card with a name, address, and/or phone number of who to contact before going onto the property, "(YES) card enclosed" will be circled. If it is unknown whether contact has been established, "(NO) need to check owner list" will be circled.

All forest industry and corporate ownerships are contacted by telephone before the field season, and a list of responses is compiled (e.g. name and phone # of person to contact when we are in the area, or A-O.K.--all roads clear).

The field coordinator will contact all industrial landowners at each new field location (as per instructions on the response list) and indicate on the plot jacket, or in other additional information under Interactive Items, what the conditions of plot access are for the field crew.

9. Owner Class Correct? This is a field-entered item that is used in updating owner class on the data file. Circle "NO" if there is clear evidence (i.e. surveyed boundary markers, conversation with owner, or courthouse records that indicates the plot falls in an ownership that is different from the downloaded/printed class. Note the source of information and the updated owner class in the space provided. Also, update the owner list (provided by field coordinator).

10. Site Index Data: This is an office (computer printed) and field entered item. Site information collected at previous occasions will be printed here and reviewed in the office for acceptability. Instructions by the reviewer to the field crew for collecting site data will be noted in "Field Check Item". The field crew will write the information on a separate line in the appropriate columns when instructed to collect more site tree data. See the following page for General Rules in collecting site trees, and the site equations used for various species.

C. Plot Site Index--Site trees.

1. Objective. Information on site index is used to evaluate the quality of a site for growing trees. Site index describes the relationship of tree height to tree age.

2. Tree selection. Select and measure site trees only if instructed to do so on the plot attribute record. New site tree data is requested when the site index information from OCC 2 is incomplete, absent, or unreliable. If you cannot obtain the required minimum number of site trees, get as many as possible. Make a note to that effect in "present condition/past disturbance" on the plot attribute record.

a.) General rules for selecting site trees.

(1) If the plot is a conifer site (Item 25 on the plot attribute record is coded "0" and plant association is a conifer type) select only conifer trees. If the plot is a hardwood site (Item 25 is coded "1" and plant association is a hardwood type), red alder site trees may be used.

(2) Douglas-fir is the preferred site species throughout the coastal Douglas-fir type in western Washington. In the Sitka spruce/western hemlock type, western hemlock is the preferred site species (select hemlock over Sitka spruce).

(3) Avoid using trees that have ever been suppressed. Be particularly careful when in residual stands from which the dominant trees have been harvested. If it is necessary to use true fir site trees, be sure that they are not released understory trees. In lodgepole pine stands, look for lodgepole site trees. Do not use cedar. Do not combine species (except for grand fir/Douglas-fir and noble fir/mtn hemlock). Silver fir could also be used in the latter group but should be avoided if possible due to the likelihood of a history of suppression.

(4) Site index should not vary by more than 20 or 30 between site trees unless the difference can be explained by actual site variation within the plot area.

b.) King's Method for selecting Douglas-fir and western hemlock site trees.

(1) Within the 5-point plot area, locate an approximately circular area that encompasses 25 trees (the "site index clump") and that is representative of the site being sampled. When there is a choice, favor well-stocked areas over sparse areas. When counting trees, include only Douglas-fir with normally-formed tops; do not include understory trees that are both younger and shorter than the general crown canopy.

(2) Of the 25 trees in the clump, select the 5 with the largest dbh as site trees (1/5 rule).

(3) Any site tree with a clear history of suppression should be rejected, and the next largest tree selected IF it is suitable. However select a suppressed tree over a shorter, suppression-free tree of the same age.

(4) If King's equation is to be used directly, the 1/5th rule must be used. If the 1/5th rule is not followed, we must select dominant trees, calculate McArdle's site, and convert to King's site index. Code "K" for King or "M" for McArdle to indicate which selection system was used and what calculation method to use.

(5) Sometimes only very young trees are available. Although site trees under 30 years breast-high age are undesirable, they are better than nothing at all. ~~Thus, trees as young as 5 years breast-high age may be used, if necessary. In stands <15 years old, select 10 trees of the largest diameter from a 50-tree clump.~~

c.) Alternate method for selecting site trees.

(1) Select trees that are or have been free from suppression for their entire lives. A tree that has been suppressed will have closely-spaced annual growth rings on all or part of its increment core.

(2) Select dominant trees.

(3) Trees less than 50 years old are undesirable if older trees are available. For ponderosa pine, trees 60 to 120 years old are most desirable, but it may be necessary to select younger trees.

(4) Site trees should be representative of the plot area.

(5) Select trees that show no signs of top-out, such as crooks or forks, UNLESS these trees are taller than normally-formed trees of the same dbh.

(6) If no suitable site trees are available from the plot area, select dominant trees from a nearby area with the same general aspect and elevation. Note in "Present condition/Past disturbance" that the site trees are not current tally trees.

Change the last two sentences of the 4th paragraph on page 63 :

Do not collect site trees younger than 15 years BH age . This means we will never have 10 site trees for a plot.

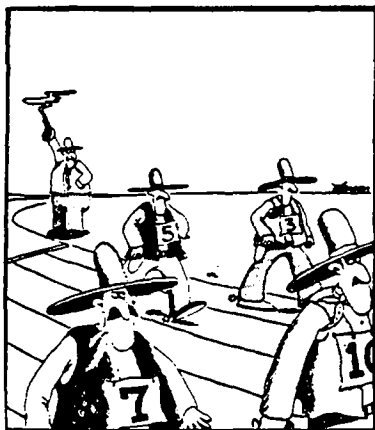
3. Data recording. For each site tree measured, record the following:

- a.) Sequence number (#). 2-digit Husky generated identification number.
- b.) Equation Used (EQ). Record a 1-digit code indicating King's or an Alternate method of site tree selection.
- c.) Species (SPC). 3-digit code; same codes as those used in tree tally Item 4, p. 94. Low elevation Douglas-fir= 203 and high elevation Douglas-fir= 204.
- d.) Dbh (DBH). 4-digit code. Record to the nearest 1/10 cm; may be estimated.
- e.) Height (OCC 1,2,3) (HT). 3-digit code; record to the nearest dm.
- f.) Remeasured height OCC3 (RHT). 3-digit code; record to the nearest dm. Height at OCC3 will be taken for all trees ≤ 30 years of age at OCC2. Age will be not be updated for these trees. This will be used to check regression equations for young trees.
- g.) Breast-high age (OCC 1,2,3) (BH AGE). 3-digit code indicating the tree's age at breast height.

D. Site Tree Data Flow

The following documentation contains ideas concerning the handling of site tree data by CAG and Data Collection for the 1988-89 field season.

1. OCC 2 site information. The OCC 2 site information is derived from individual tree information from the OCC 2 plot cards for all remeasured timberland plots.
2. OCC 3 site information. The OCC 2 site trees will be printed on the plot attribute record of each corresponding OCC 3 plot.
3. Site tree data collection & review. The review of site tree data will take place as follows:
 - a.) A plot screener will evaluate the printed OCC 2 site tree data reasonableness and completeness during the screening process, before the plot goes out to the field. Any trees not representative of the site will be deleted. The plot screener will be briefed on site index review procedure before screening. If after review there are fewer than three site trees for the plot, a note to "collect more site trees, will be under "field check items" on the plot attribute record.
 - b.) The crews will edit all plots (including site tree data written in on plot attribute record) for reasonableness, completeness.
 - c.) The new site tree data will be entered in the Husky. An average site index for each plot will be calculated by CAG. Plots without site tree information will be flagged. For all plots without adequate site tree data, site index for the plot will be hand entered by the data manager.



The 100-meter money

VI. POINT CLASSIFICATION

TABLE OF CONTENTS

	PAGE
VI. POINT CLASSIFICATION	66
Section I	67
Point number	67
Physioclase information	67
Aspect	67
Slope	67
Stream class	67
Stream proximity	68
Section II	69
Nonstockable area	69
Hardwood site	72
Root disease	73
Guide for identifying major root diseases	76
General root disease symptoms	76
Individual disease descriptions	76
Section III--Vegetation profile	78
Objective	78
Sample design.	78
Percent cover of all shrubs and all herbs.	79
Percent cover by plant species and by layer	80
Plant species that occasionally attain tree size	80
Section IV--Heights of canopy layers	82

VI. POINT CLASSIFICATION

A. Section I. (For each section, refer to page 150 for tally requirements by sample kind & GLC)

1. Point number. Record a 2-digit point number for each new and new/remeasured point.

2. Physioclase information. Point-level information on slope and aspect describes the 17-m fixed-radius circle around each sample point. Slope and aspect are important variables for explaining variations in species composition of plant communities. Point-level information is also helpful in determining plot averages.

a. Aspect. Record a 2-digit code for each new and new/remeasured point, as follows. For plots with N, S, E, W, and F aspects; leave the second digit blank. If aspect = "F", slope = "0".

<u>Code</u>	<u>Azimuth</u>
N-	338 - 22
NE	23 - 67
E-	68 - 112
SE	113 - 157
S-	158 - 202
SW	203 - 247
W-	248 - 292
NW	293 - 337
F-	Flat

b. Slope. Record a 2-digit code indicating the percent slope of the 17-m fixed-radius plot. You may record the exact slope or round to nearest 5%.

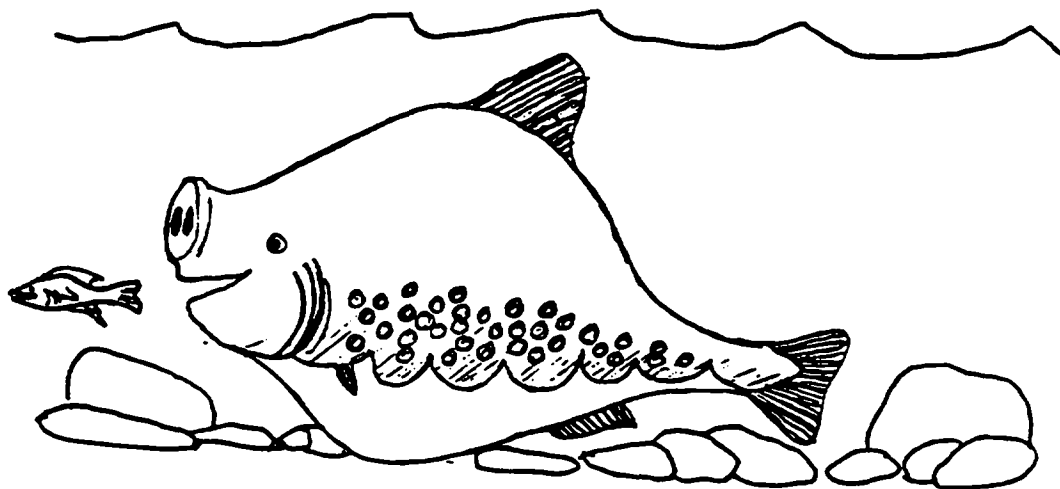
3. Stream class. 1-digit code recorded for each point describing the stream class. This item will be printed for all sample kind 1, 2, and 7 plots and updated by field crews if necessary. Information on streams is used for identifying forest land that is within the riparian zone. It also provides a data base for evaluating the impact of logging on stream sedimentation. Both a Class 1 and a Class 2 stream may occur within 65 meters of the point. Record the Class 1 stream.

The codes are defined as follows:

<u>CODE</u>	<u>STREAM CLASS</u>
0	No stream present.
1	Class 1--waters which are valuable for domestic use or important for angling or other recreation and/or used by significant numbers of fish for spawning, rearing, or migration routes. Stream flows may be either perennial or intermittent (e.g. some intermittent coastal streams serve as spawning grounds for salmon during the spring runoff). Includes open bodies of water such as lakes.

- 2 Class 2--any headwater streams or minor drainages that generally have limited or no direct value for angling or other recreation. They are used by few, if any, fish for spawning or rearing. Their principal value lies in their influence on water quality or quantity downstream in Class 1 waters. Stream flow may be perennial or intermittent.

4. Stream Proximity. 2-digit code indicating the horizontal distance in meters from the stream to each point up to 65m away. If a point was moved at OCC 2, estimate the distance from the stream to the original point location before the OCC 2 crew moved the point (this should be the pinprick location on the photos in the case of point 1). Record 00 if there is no stream within 65 m horizontal distance from the point. Allowable codes are 00 thru 65.



Example: There is a nice little stream about 4 to 6 meters wide, not too big, but you just know there are trout the size of pigs in under that overhanging brush, and that down stream (the direction you drove from this morning) about a mile is the Cowlitz river. This stream is about half as far away from point N1 as the distance between point N1 and point N2. The appropriate code at point 1 would be "1" for Stream Class and "32" for Stream Proximity.

B. Section II.

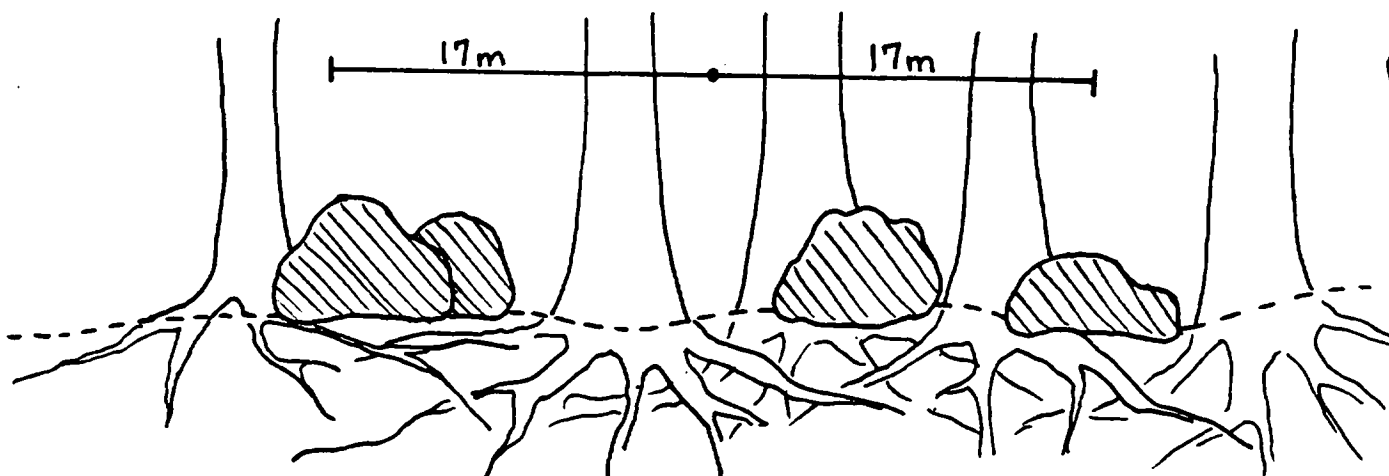
1. Nonstockable area & Nonforest inclusions--17m fixed-radius plot. Complete for all points on GLC 20 plots. Calculate the percent that rockiness, wetness, and soil conditions and nonforest inclusions reduce tree stocking within the 17-m fixed-radius circle. In calculating, use the root rot card, referring to instructions in sections D & E on page ??.

Nonstockable implies conditions that, when present within the 17-meter fixed-radius plot, permanently impair achieving full (normal) stocking. These conditions include the presence of standing or running water, a high water table, rock or shallow soil over rock, severe soil compaction (e.g. an old landing), mass soil movement (slips, slides, or slumps), and nonforest inclusions.

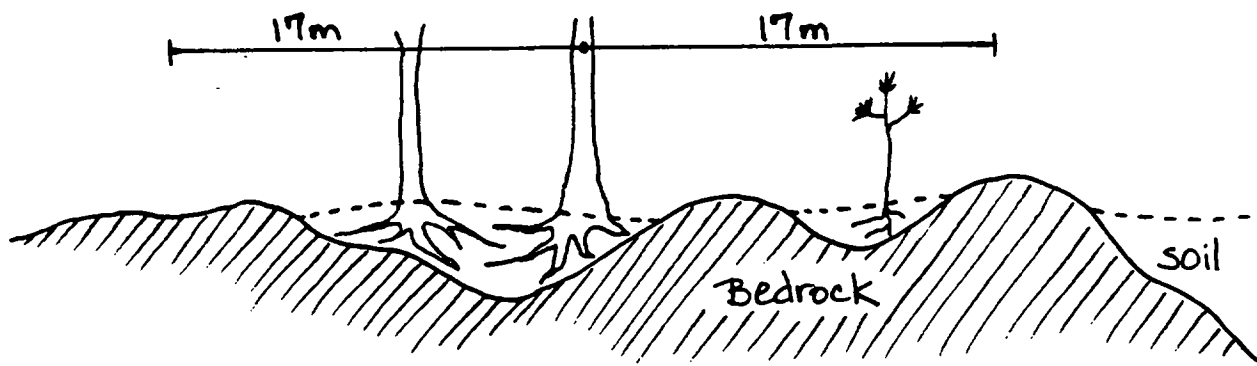
Nonforest inclusions: areas that are actually nonforest but are too small by definition (<35 m wide or <.4 ha.) to qualify as nonforest (see page 30 for examples). Nonforest inclusions are treated as a nonstockable condition to avoid concerns that these areas are capable of supporting enough stocking to qualify as forest.

For every point coded other than zero, note the kind of nonstockable area (including nonforest inclusions) by point number in "Present condition/Past disturbance" on the plot attribute record. In addition, map the nonstockable area or nonforest inclusion on the diagram for the point on the point mapping record (see pg. 75,156). Base the percent cover estimate on the nonstockable area diagram. Each shaded-in square of the grid (4 m X 4 m on the ground) represents 2 percent of the area of the fixed-radius plot a half shaded square represents 1 percent, and so forth.

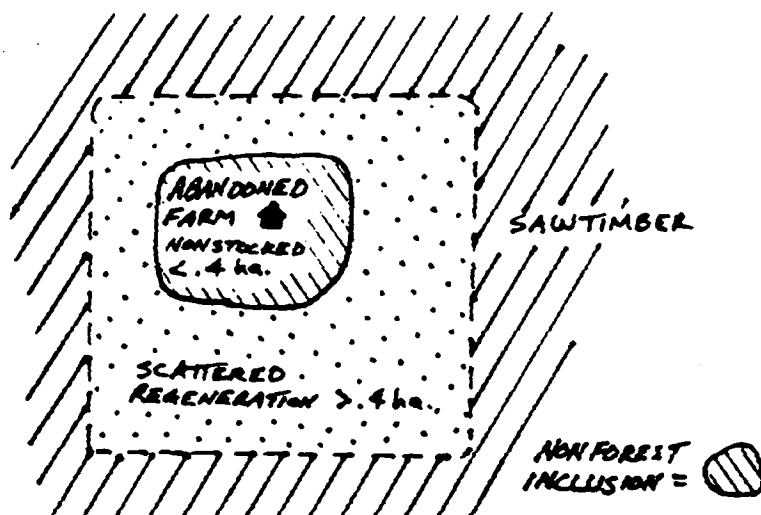
Record estimate to the nearest 5 percent on the point attribute record. Remember that a 25% cover of rocks does not necessarily reduce tree stocking by 25% (see examples below). Judge the impact of rockiness, wetness, and soil conditions based on how they would affect a fully stocked stand at maturity. Keep in mind that a fully stocked, mature Douglas-fir stand is more dense than a fully-stocked stand of Oregon white oak. Also, a boulder may reduce the stocking of seedlings but will have no effect on the stocking of a mature stand.



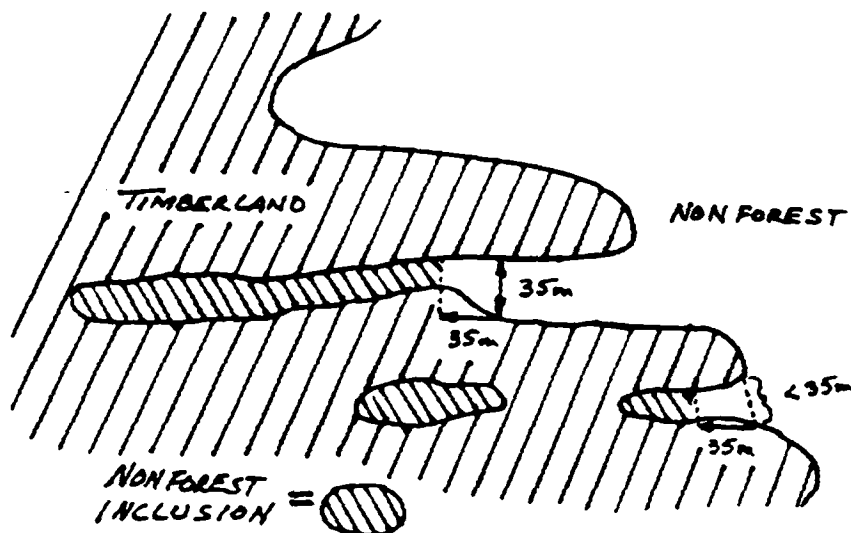
Example: Large, scattered boulders cover 25% of the 17 m fixed-radius plot. However, tree roots can fully utilize the space beneath the boulders. The boulders thus have no effect on tree stocking, and the item is coded "00".



Example: Bedrock outcroppings cover 25% of the 17 m fixed-radius plot. Because of shallow soil conditions, however, tree stocking is reduced by about 50%. This item is therefore coded "50."



Example: Nonforest inclusion (old homestead) surrounded by timberland. Keep points in same type. Include nonforest homestead in regeneration type. Code nonforest inclusion as nonstockable area.



Example: Nonforest inclusion near nonforest area. Do not move or substitute if points fall in this small type. Code nonforest inclusion as nonstockable area.

2. Hardwood site (17-meter fixed-radius plot). Complete for all new and new/remeasured points. Estimate the percent of the 17-meter fixed-radius plot that supports trees but that is incapable of supporting timberland conifers due to the presence of a high water table, standing water, and/or periodic flooding. In addition, if you are completing the point mapping record, map and label the hardwood site area on the diagram for the point (see pages 75,156). Base your percent cover estimate on the point mapping record. Each shaded-in square of the grid (4m x 4m on the ground) represents 2 percent of the area of the 17-meter fixed-radius plot. A half-shaded square represents 1 percent, and so forth. Do not include area that is totally nonstocked to all trees in your estimate for this item, as this area is accounted for in "nonstockable area".

This item will allow FIA to account for small inclusions of hardwood site within plots that are classified as conifer site (item 25 on the plot attribute record is coded "0"). The information is used in: (1) the analysis of treatment opportunity; (2) evaluating site productivity; and (3) evaluating the percent of the plot area impacted by root disease.

Identifying hardwood site. While hardwood sites can support a variety of plant communities, areas supporting red alder are perhaps the most difficult to distinguish as hardwood site vs. conifer site. Red alder grows both as a wetland and a dryland type; it often grows where timberland conifers will also grow. Red alder may occupy a site for one of the following reasons: (1) the site is too wet to support timberland conifers (this is a hardwood site); (2) the area is capable of supporting conifers, but red alder became established due to conditions favorable for its growth (this is a conifer site); or (3) the area is infected with root disease and will therefore not support susceptible conifer species (this is a conifer site). (The identification of root disease is covered in more detail on p. 73).

The presence of conifer stumps in an alder patch often indicates the alder is growing on a dryland conifer site. Alder will also grow in the coastal area in association with such a dense understory as to prevent natural conifer regeneration. In the absence of a high water table or standing water, these areas are also considered conifers sites.

Site conditions favoring red alder. Red alder germinates and grows best on moist mineral soil with full sunlight. The species is an aggressive pioneer on avalanche paths, road cuts, log landings, skid trails, and other areas where mineral soil had been freshly exposed. Red alder also tolerates poorly-drained conditions and some flooding during the growing season. Stands on poorly drained soils are therefore common. Soils supporting wetland communities are saturated, having either a high water table or standing surface water for all or during a major part of the year.

Plant species common on hardwood sites. Hardwood wetlands, in addition to supporting alder, are commonly dominated by willow, Oregon ash, and cottonwood. They often contain a shrubby component of willow, black hawthorne, and stink currant. Associated understory species include skunk cabbage (Lysichitum americanum), lady fern (Athyrium filix-femina), deer fern (Blechnum spicant), sedge (Carex sp.), water parsley (Oenanthe sarmentosa), piggy-back plant (Talmiea menziesii), hedge nettle (Stachys mexicana), spirea (Spirea douglasii), and bishop cap (Mitella sp.).

Stands of cottonwood, alder, willow, or ash growing on sandy flats alone streams are also considered hardwood sites. These areas are subject to heavy flooding that prevents the establishment of conifers.

3. Root disease (17-meter fixed-radius plot). 2-digit code recorded on SK 1-7 plots.

Root diseases, especially laminated root rot, are serious pests of conifers in Washington. However, reliable estimates of the extent of area affected are unavailable. The purpose of this root disease assessment is to determine the amount of area affected by root disease. The results will be used to estimate the impact of root disease on Washington's timber resources.

When to collect root disease data. Collect root disease data (on point mapping record and plot attribute record) when root disease is present in the stand.

How to define and map root disease infected area. Assess root disease for a 17-meter fixed-radius plot on each sample point. On each point, estimate the location and dimensions of root disease areas by using a compass and pacing or measuring distances. Sketch the infection center boundaries on the point mapping record; shade in the infected areas, and label with the appropriate code. More than one disease can occur on a 17-meter fixed-radius plot. The disease codes are as follows:

<u>Code</u>	<u>Causal fungus</u>	<u>Disease</u>
PW	<u>Phellinus weirii</u>	laminated root rot
VW	<u>Verticicladiella wagneri</u>	black stain root disease
FA	<u>Fomes annosus</u>	annosus root rot
AM	<u>Armillaria ostoyae(mellea)</u>	armillaria root disease
UK	unknown	--
NO	none present	--

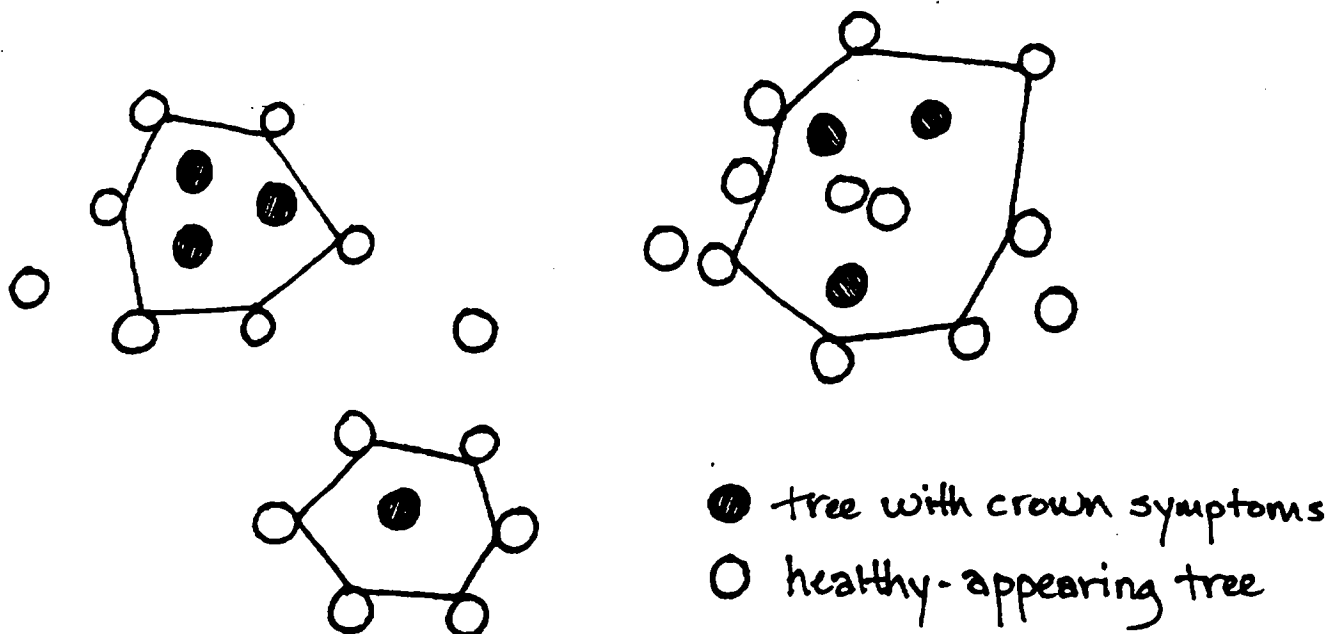
If you find evidence of root disease, but cannot identify the disease, map the affected area as usual and enter "unknown" for the disease code.

Map and estimate percent cover only for those diseases that are primary causes of tree death. Do not map or estimate percent cover for secondary infections (e.g. Armillaria that invaded a tree that was killed by Phellinus). If you find evidence of a secondary disease, note the situation on the root disease plot card for that point.

Define the boundary of an infection center using straight lines connecting the inner bole faces of healthy-appearing trees on the margin of the root disease center. A healthy-appearing tree is defined as follows:

- (1) lacks crown symptoms of root disease (reduced terminal growth increment, thin or yellow crown, distress cone crop);
- (2) has a root disease-infected tree as nearest neighbor on side toward infection center;
- (3) has a healthy tree as nearest neighbor on side away from the infection center.

When defining the boundary, do not consider islands of healthy-appearing trees inside an infection center, as these trees are likely to be infected. The following diagram shows how infection center boundaries would be defined in several situations.



Mapping nonstockable area, hardwood site, and root disease on the Point Mapping Record.

When mapping root disease infection centers, do not include areas that are hardwood site or nonstockable (these areas will not support susceptible host species). Do include areas that are conifer site but that are not currently supporting conifers due to the presence of root disease. Map and label any areas that are hardwood site or nonstockable area on the point mapping record. (See pg. 69,70 for more detailed descriptions of nonstockable area and hardwood site).

Estimating and recording percent cover of root disease on the Point Mapping Record. For each root disease present on the plot, estimate the percentage of the 17-meter fixed radius plot that is infected by the particular root rot. Base estimates on the point mapping record. Each shaded-in square of the grid (4m X 4m on the ground) represents 2 percent of the area of the 17-meter fixed-radius plot. One half shaded square represents 1 percent, and so forth. If no root disease is present, enter "00".

ROOT DISEASE PLOT CARD

COUNTY Example PLOT 006

DATE 07/14/88

CREW Mom, Pop and Kiddo

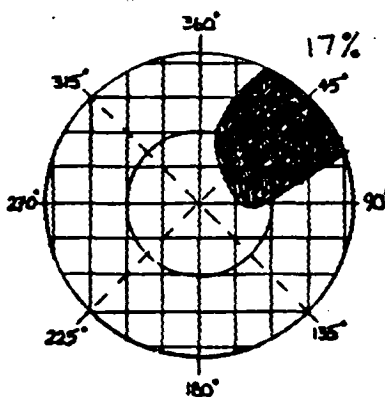
DISEASE CODES

PM = Phellinus (Laminated)
 BS = Black stain
 AM = Armillaria
 FA = Fomes annosus
 UK = Unknown
 NO = None

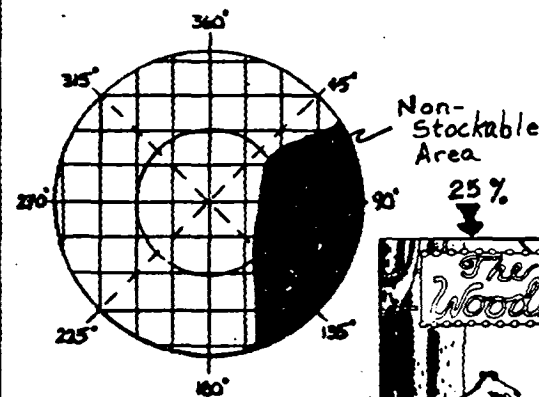


Grid interval = 4 meters

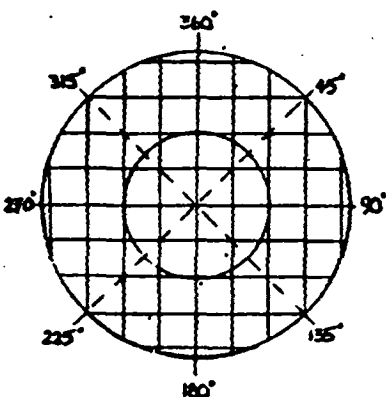
POINT # 11 DISEASE PM



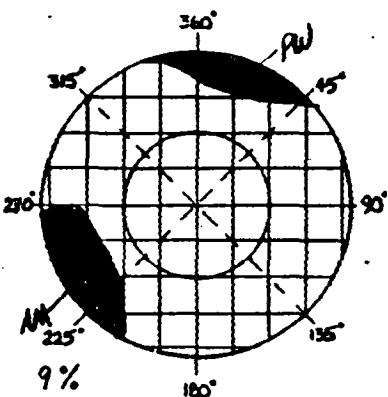
POINT # N2 DISEASE NO



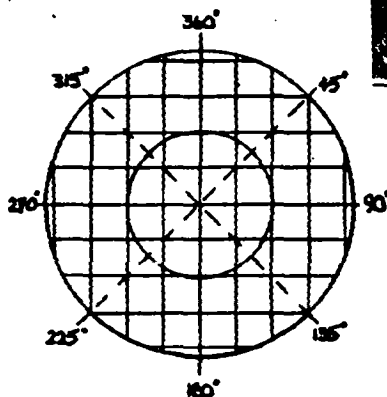
POINT # N3 DISEASE NO



POINT # N4 DISEASE PM, AM



POINT # N5 DISEASE NO



B. - GUIDE FOR IDENTIFYING MAJOR ROOT DISEASES

1.) General Root Disease Symptoms:

Root disease centers or "pockets" usually appear as patches or groups of dead and dying trees. Trees in all stages of decline (old dead, recent kills, declining) are usually present; old dead trees are found at the center of the pocket, while declining trees occur near the leading edge of the expanding diseased area (in contrast, bark beetle patch kills usually consist of trees that died suddenly and simultaneously with each other). Windthrown trees with decayed roots broken off close to the root collar (root ball) may be evident, except for Black stain root disease, which does not form root balls. Individual trees affected by root disease may exhibit the following above-ground symptoms:

- a.) Reduced height growth increment (as compared to neighboring healthy trees). This results from gradual decline as the root system is slowly destroyed. Look for progressively short internodes of the terminal leader.
- b.) Sparse, yellow crowns. Trees infected by root disease fungi often lose needles; needles that remain are often yellow.
- c.) Distress cone crop. In the later stages of decline, infected trees may produce an abundant crop of unusually small cones.

2.) Individual Disease Descriptions:

Laminated Root Rot: Affects all conifers; most commonly Douglas-fir, true-fir, and hemlock. Windthrown trees have decayed roots broken close to root collar, forming root balls. When duff and soil are removed to expose roots, look for grey-white mycelium on surface of roots--(*Armillaria* will have white mycelium on the inside of roots, between the bark and wood). The mycelium penetrates only the outermost few millimeters of bark, forming a crusty sheath that cannot be rubbed off easily.

Laminated root rot is most easily identified by examining decayed wood which can be found on root balls or in stump hollows. Decayed wood separates readily along annual tree growth rings, hence the name "laminated" root rot. Yellowish-brown decayed wood is usually dry and contains numerous 1 millimeter-long oval pits. Reddish-brown wiry whiskers can usually be found between layers of decayed wood (these are best seen with a 10 x magnifying lens).

Armillaria Root Disease: Affects all conifers and hardwoods. Root balls on fallen trees occur in disease centers. Heavy resin flow near base of tree is common. Chopping into root collar or root will reveal white, fan-shaped mats of mycelium between wood and bark. The mats have a texture that may remind one of peeling partially-dry laytex paint off a glass surface (if one has ever done that). The mycelium can penetrate a few millimeters into the inner bark, but never evident on the outside of the bark or root surfaces (laminated root rot has grey-white mycelium on the outside). Decay in root balls and stumps is soft, spongy, yellowish, stringy, and often contains numerous black lines.

Black Stain Root Disease: The primary host is Douglas-fir, but it can affect hemlock and pines. Infected trees occasionally have resin flow at the base, but not always. Brown to black streaks in the sapwood (usually in the last 3 to 4 annual rings) of the root collar and roots are the best indication of the disease. You must chop into the wood to diagnose Black stain, it does not occur in or on the bark of bole or roots. Root balls are not present in Black stain disease centers (unless other root disease is present), because the fungus does not rot roots--it plugs sapwood tracheids causing trees to die standing.

Annosus Root Disease: Most common on true-fir, pine, and hemlock. Most difficult to identify of the major root diseases. Root balls may be present in disease centers, particularly in true-fir stands. Decay is soft, spongy, white (often with silvery cast) with black flecks (like small wild rice grains scattered through the decay). Small bracket-shaped conks may be present in stump hollows or under duff near root collar of infected dead trees or stumps. Annosus is often identified by default--if it is not one of the other root diseases, and if the symptoms suggest root disease and the decay is similar to the description, then it is probably Annosus.

C. Section III--Vegetation Profile.

1. Objectives. Information on the structure and species composition of plant communities has many uses. FIA scientists and inventory customers have found such data useful for evaluating wildlife habitat, forage availability, grazing potential, extent and characteristics of forest vegetation, and land productivity in terms of biomass. In western Washington, we are collecting information on the vegetation profile primarily so we can assess wildlife habitat resources. Layers of vegetation provide habitat for wildlife for breeding, feeding, and resting. Because we are remeasuring vegetation profile plots established at OCC2, we are also obtaining general information about how vegetation is changing in western Washington.

2. Sample design. Objectives of the sample design for the OCC3 vegetation profile, and field procedures for meeting them, are listed below. Information on OCC3 procedures is also summarized in the table that follows.

a.) Remeasure the OCC2 vegetation profile wherever one is present; collect new or reconstructed information where no OCC2 vegetation profile exists. The OCC2 vegetation profile included shrubs and herbs--no trees. At OCC2, vegetation profiles were measured on all GLC 20 plots, on all 5 points of the 5-point plot. On N/R points at OCC3, we are remeasuring the vegetation profile established at OCC2. On N points on new plots (SK 5,6), we are establishing a new vegetation profile. On reconstructed points, (N points on SK 1,2,3,4,7), we are reconstructing a remeasured vegetation profile.

b.) Estimate the vegetation profile on the same 3.3-m fixed-radius plot used for trackable trees <17.5 cm. This general rule was established at OCC2, and is continued at OCC3. (On other forest plots (sample kind 8), we are measuring the vegetation profile on a 17-m fixed-radius plot).

c.) Do not include trees in the vegetation profile UNLESS they are seedlings, or the plot is a sample kind 8--GLC 41,44,46. In western Washington, we are calculating density information in the office for trees 2.5 cm d.b.h. and larger, using stocking data. Trees of this size are therefore excluded from the OCC3 vegetation profile--except on sample kind 8 plots, where there is no trackable tree tally. Because accurate stocking data are not available for trees <2.5 cm d.b.h. (we do not tally all seedlings present on the fixed-radius plot), seedlings are included in the OCC3 vegetation profile.

3. Reconstructing vegetation profiles (N points on SK 1,2,3,4,7). Complete the OCC2 and OCC3 data on the vegetation profile tally so that the point appears as if it were an N/R point. If there has been no disturbance since the date of the OCC2 inventory, backdate OCC2 data (spp. & percents) the same as OCC3 data. If the point has been disturbed and there is evidence the vegetation has been affected, backdate OCC2 data based on your best judgement.

SUMMARY OF TALLY REQUIREMENTS FOR OCC3 VEGETATION PROFILE

<u>GLC</u>	<u>Kinds of points</u>	<u>Kind of vegetation</u>	<u>Plot size</u>
20	N/R,N	Shrubs/herbs + seedlings	3.3 m
41,44,46	N	Shrubs/herbs + all trees	17 m

4. Percent cover of "all shrubs" and "all herbs." Estimate percent cover as the portion of the fixed-radius plot covered by all plants in the particular plant group. For shrubs, record the percent cover of shrubs of all canopy layers. For herbs, record the percent cover of herbs of all canopy layers. Estimate percent cover as the portion of the fixed-radius plot that would be obscured by all shrub species/all herb species if viewed from directly above the plot. Areas of overlapping shrub crowns (for all shrubs) and herbs (for all herbs) can only be "counted" once. (In other words, percent cover within a group cannot exceed 100 percent). In estimating cover, include the entire area within the general outline of a plant; ignore minor gaps between branches, and holes in the center of the plant.

Record percent cover to the nearest 5 percent, using a two-digit code. If all shrubs or all herbs on a point comprise less than 3 percent cover, record a zero for that item. Record total canopy closure as a "99."

On each sample point, percent cover for a particular plant group should not exceed the sum of percent cover estimates for individual species in that group. The exception is when you have several species present in trace amounts (<5% cover). In many cases, the sum of cover estimates for individual species will be greater than the cover for the group as a whole.

5. Percent cover by plant species and by layer.

a.) General tally procedures. This portion of the vegetation profile provides information on the crown cover of individual species by canopy layer. The vegetation layers referred to here are defined in the following section.

Line entries are grouped separately by trees, shrubs, and herbs. Where present, OCC2 data have been edited for valid codes and printed/downloaded in the appropriate section. On each plot, only one line can be entered for each plant species and canopy layer present. The number of line entries for a particular species may not exceed the maximum allowable number of canopy layers for that plant group: 3 for trees, 2 for shrubs, and 2 for "herbs." On remeasured points, OCC2 species, OCC2 height, and OCC2 percent cover are printed/downloaded. Enter the appropriate OCC3 data on the same line, as described in the following paragraphs.

b.) OCC2 and OCC3 species. Each line entry must have a species code recorded in the "OC2 SPP" and/or the "OC3 SPP" column, using the species codes listed in the plant guide. If you cannot identify a plant species while in the field, collect a sample for later identification. If you cannot identify the species of the plant, record the code for its genus if possible. If not, record one of the following: SHRUB (for any shrub), FORB (for any forb), GRASS (for any graminoid, including grasses, sedges, and rushes), or FERN (for any fern).

6. Plant species that occasionally attain tree size. On the vegetation profile, creek and redstem dogwood (*Cornus* spp.), cascara buckthorn (*Rhamnus purshiana*), and willow (*Salix* spp.) should be tallied as shrubs unless they are, or will become trees. (A tree is defined as a woody plant that commonly has an erect perennial stem or trunk at least 7.5 cm dbh and a total height of at least 4 meters). Many other species (listed on p. 94) occasionally attain tree size but are always considered shrubs and are always tallied on the vegetation profile.

On remeasured vegetation profiles, compare the printed/downloaded OCC2 species codes with the vegetation on the fixed-radius plot. If OCC2 species is correct, you do not need to enter an OCC3 species. OCC3 data (layer and percent cover) are entered on the same line. There are two conditions under which the OCC2 species must be updated. In the following cases, record the updated species in the "OC3 SPP" column; never delete the OCC2 species code.

(1) If the species was obviously misidentified at OCC2, record the correct species in the OCC3 species column. OCC3 data are entered on the same line as the OCC2 data.

(2) At OCC2, plant species were often identified according to broad groups: "grass" (recorded as a "1" on the OCC2 plot card), "grasslike" (2), "forbs" (3), or "shrubs" (4)). Where possible, record the genus and species for these entries in the "OCC3 species" column, and enter the OCC3 data on the same line as the OCC2 data.

If more than one individual plant species were grouped together in one of these line entries, add new, separate lines for them. On the added lines, complete the OCC2 as well as the OCC3 percent cover columns. For each sample point, the sum of the OCC2 percent covers of the two or more added lines should equal the OCC2 percent cover of the line that is being replaced. Do not record any OCC3 data on the line that is being replaced.

Adding new species. If a species was obviously missed at OCC2, add a new line for it. The OCC2 percent cover for missed species equals the OCC3 percent cover. If there is a new species present that was not present at OCC2 ("ingrowth"), add a new line entry. Record OCC2 percent cover as zero for "ingrowth" species.

c.) OCC2 height (dm). 3-digit code, printed/downloaded, that indicates the height recorded by the OCC2 field crew. This item is provided for the OCC3 field crew's information, and should not be updated. Correct OCC3 heights should be reflected in the layer code (see following).

d.) Canopy layer. Record a 1-digit canopy layer code for each line entry. The code indicates the height of the species at OCC3. The codes correspond to the canopy layers described in Section D.

e.) Percent cover. Record percent cover to the nearest 5 percent, using a 2-digit code. Do not record plants with less than 3 percent cover. Record total canopy closure as a "99."

(1) General rules. For each line entry and sample point, estimate percent cover as the portion of the fixed-radius plot that would be obscured by all plants of the species and layer if viewed from directly above the fixed-radius plot. Areas of crown overlap by plants of the same species and layer can only be "counted" once. (In other words, percent cover within a species/layer cannot exceed 100 percent). In estimating cover, include the entire area within the general outline of a plant; ignore minor gaps between branches, and holes in the center of the plant.

(2) OCC2 and OCC3 percent cover on remeasured points. For each species and height on the plot, the percent cover estimates recorded at OCC2 have been printed/downloaded. For these species, examine current conditions on the fixed-radius plot to see if "substantial change" (defined below) has occurred. If yes, record the current percent cover of the species in the OCC3 percent cover column. If no, record the same percent cover for OCC3 that is printed/downloaded for OCC2.

Substantial changes in percent cover since OCC2 are usually the result of a disturbance in the plot area between OCC2 and OCC3, or just prior to OCC2. Examples of common disturbances are: timber harvest and management activities, grazing, natural events such as windthrow, insect kill, flooding, and fire. Substantial changes can also occur in the absence of any discernible disturbance, and should be recorded.

Insert on page 81

Record trace occurrences (<5% cover, coded as 1%) of all species of seedlings present on the veg profile.

In general, a change in percent cover should only be recorded if the OCC3 estimate differs from the OCC2 estimate by at least 20 % cover. We cannot be sure if differences of less than 20 % cover are due to real change or to differences in the estimators (ocular estimates of cover are imprecise).

Changes of less than 20 percent can be coded under certain circumstances:

a) If you can determine that the vegetation has changed as a direct result of real, physical disturbance in the plot area since or immediately prior to OCC2, you may code a change of less than 20 percent. b) If the OCC2 percent cover was coded as less than 20, and the current cover is less than 3 percent, record a zero for OCC3 percent cover. c) If a plant was not recorded at OCC2, and is now present with at least 3 % cover, record it. For species obviously missed at OCC2, record a percent for OCC2 as well OCC3.

(3) N points. Use the same guidelines described for remeasured points to determine how to backdate OCC2 data.

D. Section IV--Heights of canopy layers. Record height as a 3-digit code to the nearest decimeter.

1. Tree layers.

a.) Sample kinds 1-7. On all 5-point plots, only one tree layer can be recorded as present. This is because only seedlings are included on the vegetation profile on these plots.

b.) Sample kind 8. On 1-point plots, up to three layers may be present. Determine how many distinct layers of trees are present in the 17 meter fixed-radius plot. These canopy layers are the basis for the estimates of percent cover recorded on the vegetation profile. Heights of tree layers must differ by at least five meters to be considered "distinct." Record the average height of the plants in each of the layers.

(1) Height of tree layer 1. Record a 3-digit code that describes the average height of all trees in the tallest canopy layer.

(2) Height of tree layer 2. Record a 3-digit code that describes the average height of all trees in the second-tallest canopy layer.

(3) Height of tree layer 3. Record a 3-digit code that describes the average height of all trees in the third-tallest canopy layer.

2. Shrub layers. Determine if there are one or two layers of shrubs present in the plot area. Heights of shrub canopy layers must differ by at least one meter to be considered "distinct." A plot may have a maximum of two shrub layers. As you complete the plot, you may want to adjust these heights to more accurately reflect the layers present on the five fixed-radius plots.

a.) Height of shrub layer 1. Record a 3-digit code that describes the average height of all shrubs in the tallest canopy layer present in the plot area. If no shrubs are present, record a zero for this item.

b.) Height of shrub layer 2. Record a 3-digit code that describes the average height of all shrubs in the shortest canopy layer. If fewer than 2 canopy layers are present record a zero for this item.

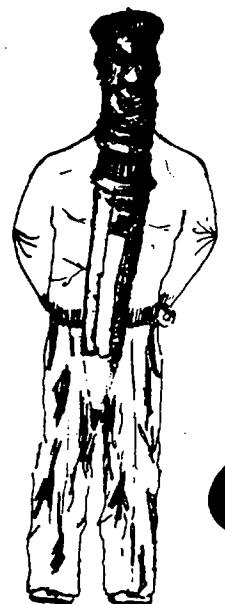
3. Herb layers. Determine if there are one or two layers of herbs (all non-tree and non-shrub vegetation) present in the plot area. Heights of these layers must differ by at least five decimeters to be considered "distinct." A plot may have a maximum of two herb layers. As you complete the plot, you may want to adjust these heights to more accurately reflect the layers present on the five fixed-radius plots.

a.) Height of herb layer 1. Record a 3-digit code that describes the average height of all herbs in the tallest layer present in the plot area. If no herbs are present, record a zero for this item.

b.) Height of herb layer 2. Record a 3-digit code that describes the average height of all herbs in the shortest layer present in the plot area. If fewer than 2 layers are present, record a zero for this item.

Remember to record all shrubs and all herbs for each point.

[this page intentionally blank for you and your friends]



VII. TRACKABLE TREE TALLY

TABLE OF CONTENTS

	PAGE
VII. TRACKABLE TREE TALLY	85
Tree selection	86
3.3-m fixed-radius & NE quadrant	86
BAF 7 prism plot & 17-m fixed-radius plot	89
Tree identification and measurement	91
Item 1--Line number	91
Item 2--Point number	91
Item 3--Tree history	93
Item 4--Species	94
Monumenting information	95
Item 5--Azimuth	95
Item 6--Distance	95
Item 7--Tree number	95
Item 8--OC2 INC	96
Item 9--OC2 dbh	96
Item 10--OCC 3 dbh	97
Item 11--OC2 height	102
Item 12--OCC 3 height	102
Item 13--Breast-high age	104
Item 14--OC2 crown ratio	106
Item 15--OCC 3 crown ratio	106
Item 16--OC2 crown class	106
Item 17--OCC 3 crown class	106
Item 18--Growth impactor	108
Guide for identifying insect damage	111
Item 19--Cause of death	112
Item 20--Dwarf mistletoe	112
Item 21--Bigleaf maple clump	113
Item 22--Cull other	114
Item 23--Cull rot category	116

VIII. TRACKABLE TREE TALLY

A. Tree selection.

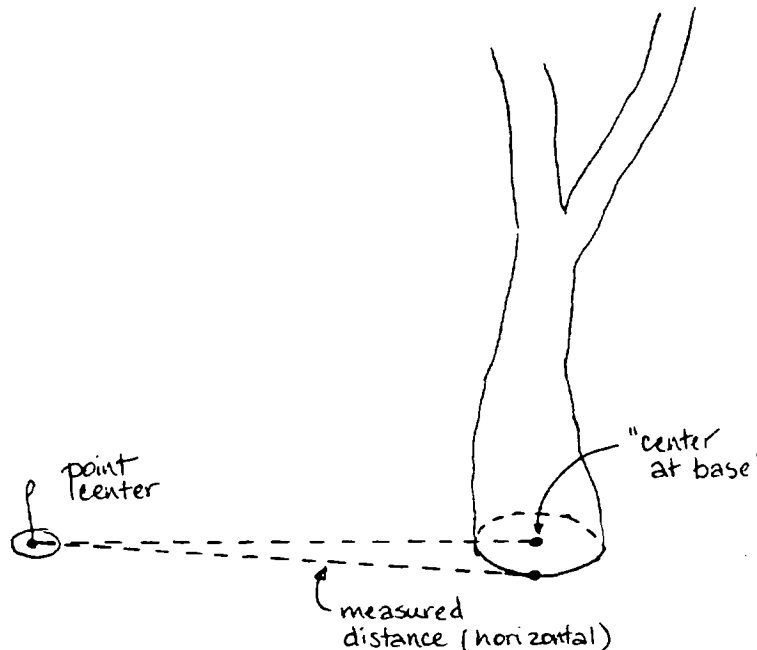
Objective. The objective of the trackable tree tally is to obtain information on the density, growth, vigor, mortality, harvest, size, and volume of trees present on the plot.

1. 3.3 meter fixed-radius and northeast quadrant (trees < 17.5 cm dbh)

Purpose--Seedlings, saplings and poletimber trees are more efficiently sampled using a fixed-radius plot than a variable radius (prism) plot. The 3.3-m radius represents the limiting distance of a tree with a 17.5 cm dbh. Tally trees <17.5 cm dbh when the "center at the base" is within 3.3 horizontal meters of point center (see figure below).

Tally tree definitions

- Seedling: A young tree having a diameter at breast height equal to or less than 2.5 cm. Includes trees with a height less than 1.37 m.
- Sapling: A tree having a diameter at breast height of 2.5-12.4 cm.
- Poletimber: Trees that will yield logs suitable in size and quality for the production of poles. FIA poletimber tree is one with d.b.h. between 12.5 cm and 22.4 cm.
- Sawtimber: Trees that will yield logs suitable in size and quality for the production of lumber. FIA sawtimber tree is one with d.b.h. of 22.5 cm or larger.



a. Tally in the NE quadrant of the 3.3-m fixed-radius plot (<12.5 cm dbh).

(1) Sapling tally (dbh 2.5-12.4)

Sample kind 1-6 (full measurement)--On all plots except walk-throughs, tally all trees 2.5-12.4 cm dbh that are in the northeast quadrant of the 3.3-m plot.

N/R points on sample kind 1-2 (full remeasurement)--On full remeasurement plots (SK 1,2) be sure to account for all trees that were tallied in the NE quadrant at occasion 2. All live trees which have a recorded occasion 2 dbh will be tree history 1, dead trees will be tree history 5 and killed trees will be tree history 3. Live trees without an occasion 2 dbh (e.g. trees that germinated since occasion 2 or were extra untallied seedlings at occasion 2) will be given a tree history 4. Trees that were obviously "in" but missed at occasion 2 will be given a tree histories of 6, backdated occasion 2 dbhs, and other required tree characteristics.

N points on SK 1-7--All live trees on reconstructed plots will be given a tree history of 2. Trees believed to have been saplings at occasion 2 that are now dead will be tree history 5. Trees believed to have been saplings at occasion 2 that have been killed or cut will be given tree history 3.

N/R points on sample kind 7 (walk-throughs)--On walk-through plots, tally all trees that were 2.5-12.4 in dbh at occasion 2. These trees, if living, will be given a tree history of 1. In addition, tally any trees now 2.5 or larger that were either ungerminated or extra seedlings at occasion 2 and record as tree history 4.

(Warning: These trees could be larger than 12.5). Reconstruct trees obviously missed at occasion 2 and tally as tree history 6.

(2) Seedling tally (< 2.5 cm)

Sample kind 1-7--If the tally in the NE quadrant of the 3.3-m fixed-radius plot is less than 3, tally seedlings, when present, until the total tally in the NE quadrant is 3 trees, using the following rules:

(a) The seedling must be capable of living at least 10 years (Do not tally suppressed seedlings (definition on p.).

(b) Do not tally conifers that will be overtopped by other conifers in the stand before they reach 22.5 cm in dbh. (ignore residual overstory trees and sawtimber trees overtopping a tolerant understory.)

(c) If seedling is dominant or codominant and less than 1.37 m tall, it must be at least .5 m from any other tally tree. If seedling is intermediate or overtopped and any height, it must be .5 m from any other tally tree.

(d) Tally seedlings with the following species priority:

1. conifer other than cedar or pacific yew.
2. cedar
3. red alder or cottonwood
4. all other hardwoods (Do not tally yew, dogwood or sp.999).

Within species groups, tally in order of dominance.

(e) Tally only one sprout of any size from a bigleaf maple clump. If no larger stems have been tallied, one maple seedling may be tallied from a maple clump.

(b) Tally in the 3.3-meter fixed-radius plot (12.5-17.4 cm dbh).

Sample kind 1-6.--Tally all live trees 12.5-17.4 cm.

N/R points on sample kind 1-2 (full remeasurement)--Account for all trees tallied at occasion 2 with an occasion 2 dbh of 12.5-17.4. These trees will be given a tree history of 1 if alive, 5 if they died naturally and 3 or 8 if killed or cut. Trees in the SE, NW or SW quadrant that were less than 12.5 cm at occasion 2 are new trees and will be given a tree history 2. Trees obviously missed at occasion 2 will be reconstructed and given a TH 6.

N points on SK 1-7 --Live trees will all be given a tree history 2. Trees identified as having died, been cut or killed since occasion 2 will be tallied and given appropriate tree histories as on sample kind 1-2.

N/R points on sample kind 7 (walk-through) --Tally only trees that were 12.5-17.5 cm at occasion 2. Do not tally trees that were < 12.5 cm at occasion 2 regardless of their occasion 3 dbh. Trees that were 12.5-17.4 cm at occasion 2 and were obviously missed will be reconstructed at occasion 2 and given a tree history of 6.

Sample kind 1,2,7.---Data for trees tallied on the 3.3-m fixed radius plot at occasion 2 are printed on a computer generated occasion 3 tally sheet and downloaded on the Husky file. If no trees were tallied at occasion 2, one line is printed/downloaded showing the line number and first digit of the 2-digit point number. If there is occasion 3 tally (other than TH 7 and TH 9), delete or cross out the line; do not use the occasion 2 line number for occasion 3 data. If no trees are tallied at either occasion, record the occasion 3 point number and a tree history of 0. Enter "no tally" in remarks. Record two reference trees on separate lines.

Purpose--Large trees (≥ 17.5 cm dbh) are more efficiently sampled with a prism than on a fixed-radius plot. Trees ≥ 90 cm are sampled on a 17-m fixed-radius plot in order to avoid tallying trees that are too far out to influence growing conditions at point center.

Use the prism to identify trees that are clearly "in" or "out." Use the following method to check all other trees. Refer to previous diagram.

- (1) Drive a nail into the tree at breast height (point C), at a location that is perpendicular to the sample point.
- (2) With a tape, measure the slope distance from point C to point A.
- (3) Using a clinometer, measure the slope along this line (sighting from point C to point A). Use the slope correction table in Appendix 4 or the Husky "limiting distance program" to calculate the actual horizontal distance from C to A; this distance equals the distance from B to D.
- (4) Compare this calculated horizontal distance with the limiting distance for a tree of that dbh. If the actual distance is less than the limiting distance, the tree is "in." If the actual distance is greater than the limiting distance, the tree is "out."

Limiting distances are presented in a table on p. 143. The limiting distance for a particular tree may also be calculated in the Husky data recorder which uses the following equation:

$$L = F \times \text{dbh} \quad \text{where: } L = \text{limiting distance in meters;} \\ F = 0.18896 \text{ for 7 M BAF prism;} \\ \text{dbh is in centimeters.}$$

- (b) Prism tally and 17-m fixed-radius tally on N/R points on SK 1-2 (full-remeasurement) plots. In addition to the live tree tally (see above) all trees tallied at occasion 2 will be accounted for. All live trees tallied at occasion 2 will be tree history 1. Live trees that were "out" at occasion 2 but are now "in" with the prism are tree history 2. Tally trees that died since occasion 2 are tree history 5 and harvested trees are tree history 8. Trees felled or killed but not removed from the site are tree history 3. Trees obviously missed at occasion 2 will be given a backdated occasion 2 dbh and estimated tree attributes. The tree history of backdated trees will be 6.
- (c) Prism tally and 17-m fixed radius tally on N points on SK 1-7. In addition to the live tree tally (see above) all dead trees and stumps that are believed to have been alive at occasion 2 will be tallied. Live trees will be tree history 2 and dead trees and stumps will be tree history 5, 3, or 8.

(d) Prism tally and 17-m tally on N/R points on SK 7 (walk-through) plots. All trees that were ≥ 17.5 and < 90 cm dbh at occasion 2 must be accounted for as must all trees > 90 cm dbh at occasion 2 and within 17 meters of plot center. Live trees will be given a tree history of 1, dead trees a tree history of 5 and stumps a tree history of 8. Trees killed but not harvested will be given a tree history of 3. No new trees will be tallied at occasion 3 on sample kind 7 plots. Trees obviously missed at occasion 2 will be given a backdated occasion 2 dbh and estimated tree attributes. The tree history of backdated trees will be 6.

(e) Data recording. Record on line on the Husky data recorder for each tree. Complete the required items as indicated in the tally guide. If there is no tally on the point other than tree histories 7 or 9, record one line with the point number, a tree history 0, and enter "no tally in remarks." Enter two additional lines with TH 9 reference tree data.

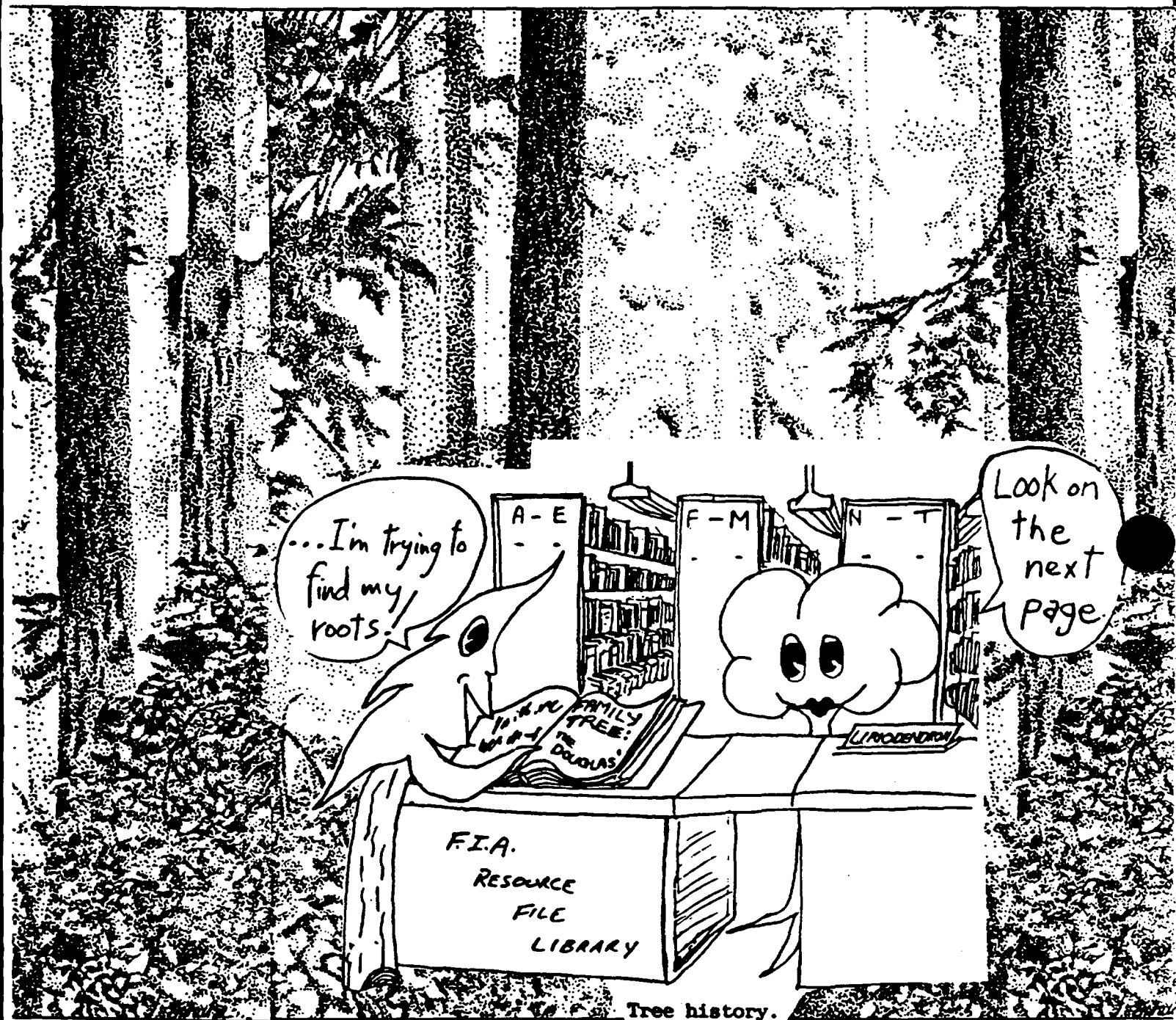
B. Tree identification and measurement. Refer to the tally guides or Appendix 8 to determine what items to complete for a particular kind of tree. Tree data printed on the trackable tree tally record is from OCC2 for all tree histories.

1. Item 1--Line number (LINE). 5-digit code printed on the trackable tree tally record for OCC 2 tally trees. New tally trees are assigned a line number by the Husky. This code is used in data compilation and will not be changed by the field crew. The same line # is used twice for mortality trees (TH 5) that are tallied as snags (TH 7) at OCC3.

2. Item 2--Point number (PT). A 2-digit code recorded for all trees on all points. The first digit is printed or downloaded on the trackable tree record for new/remeasured points and will not be changed.

On new/remeasured points, the first digit is the OCC 2 point number (1-5); the second digit is the OCC 3 point number.

On new points, the first digit is an "N" for new; the second digit is the new point number (1-5).



Tree history.

3. Item 3--Tree history (TH). 1-digit code needed for all trees. A "1" will be printed for all OCC2 tallied live trees. Change the printed code if the tree has died or been cut. Record a 1-digit code if none printed. Use the following guidelines:

Code	Tree history	Description
------	--------------	-------------

- | | | |
|---|---------------|---|
| 0 | No Tally | No tally point. |
| 1 | Remeasured | Tree tallied at OCC 2 that is alive at OCC 3. |
| 2 | New, N pts. | Any tree tallied on an N point. |
| 2 | New, N/R pts. | Tree tallied for the first time at OCC3 that is not in the NE quadrant of the 3.3m fixed-radius plot (trees new to the NE quadrant are ingrowth, TH 4). |

Code	Tree history	Description
------	--------------	-------------

3	Culturally killed; or firewood/local use	Tree tallied at OCC 2; now dead. Death was caused by human activity other than harvest as defined by TH 8 Includes trees killed in logging but not hauled away as part of the harvest, precommercially thinned trees, and trees cut and utilized locally for firewood or other purposes. Change the printed or downloaded code "1" to "3." Identify firewood/local use trees as such in the remarks column of the trackable tree tally.
---	---	--

- | | | |
|---|---------------|---|
| 4 | OCC3 Ingrowth | Trees tallied for the first time in the NE quadrant of the 3.3-m fixed-radius plot. Does <u>not</u> include trees missed at previous inventory; those trees must be back-dated. (see TH 6) |
| 5 | Mortality | Live tree tallied at OCC 2; now dead. Death was due to "natural" and not human causes. (Includes partially uprooted windthrows leaning more than 45 degrees). Change the printed or downloaded code "1" to a "5". In addition, if the dead tree qualifies as an "in" snag, record a <u>separate line</u> with a tree history "7", and complete the required tally items. Includes tallied OCC2 seedlings now dead or not tallied at OCC3. |

- | | | |
|---|-----------|--|
| 6 | Backdated | Live trees on SK 1,2,7 that have backdated diameter. |
|---|-----------|--|

- | | | |
|---|------|--|
| 7 | Snag | Includes snag tallied for the first time, snag tallied at OCC2 still a snag, tree recorded as live tree at OCC2 now a snag; and snag tallied at OCC2 now "gone". |
|---|------|--|

8	Harvested	Tree tallied at OCC 2; harvested since OCC 2 (cut and hauled to mill). Does NOT include trees utilized locally for firewood or other purposes. Change the printed or downloaded code "1" to "8."
---	-----------	--

- | | | |
|---|-----------|---------------------------------|
| 9 | Reference | <u>Nontally</u> reference only. |
|---|-----------|---------------------------------|

4. Item 4--Species (SPC). 3-digit code, printed/downloaded on the trackable tree tally record for trees tallied at OCC 2. Change the printed/downloaded code if the species was misidentified at OCC 2 (note "species misidentified" in remarks column). Record a 3-digit code for all new trees.

<u>Code</u>	<u>Species</u>	<u>Code</u>	<u>Species</u>
011	Pacific silver fir	312	Bigleaf maple
017	Grand fir	351	Red alder
019	Subalpine fir	361	Pacific madrone
022	Noble fir	376	Western paper birch
042	Alaska-yellow-cedar	431	Golden chinkapin
072	Subalpine larch	492	Pacific dogwood
093	Engelmann spruce	542	Oregon ash
098	Sitka spruce	600	Walnut
101	Whitebark pine	660	Apple
108	Lodgepole pine	746	Quaking aspen
119	Western white pine	747	Black cottonwood
122	Ponderosa pine	760	Bitter cherry
202	Douglas-fir	815	Oregon white oak
231	Pacific yew	999	Other trees (identify in remarks) or unknown. May include willow and cascara buckthorn.
242	Western redcedar		
263	Western hemlock		
264	Mountain hemlock		

Tally individuals of the following species as trees if they are, or will become, trees. (A tree is defined as a woody plant that commonly has an erect perennial stem or trunk at least 7.5 cm dbh and a total height of at least 4 meters.)

Creek and redstem dogwoods (Cornus spp.)
 Cascara buckthorn (Rhamnus purshiana)
 Willow (Salix spp.)

Although the following species occasionally attain tree size, they are always considered shrubs and are not tallied as trees.

Vine maple (<u>Acer circinatum</u>)	Ceanothus (<u>Ceanothus spp.</u>)
Mountain maple (<u>Acer glabrum douglasii</u>)	Red or water birch (<u>Betula occidentalis</u>)
Douglas maple (<u>Acer glabrum douglasii</u>)	Bog birch (<u>Betula glandulosa</u>)
Indian plum (<u>Osmaronia cerasiformis</u>)	Silktassel tree (<u>Garryana spp.</u>)
Ocean spray (<u>Holodiscus discolor</u>)	Rhododendron (<u>Rhododendron spp.</u>)
Hazel (<u>Corylus spp.</u>)	Poison-oak (<u>Toxicodendron spp.</u>)
Mountain ash (<u>Sorbus spp.</u>)	Chokecherry & Klamath plum (<u>Prunus spp.</u>)*
Thinleaf alder (<u>Alnus tenuifolia</u>)	Serviceberry (<u>Amelanchier spp.</u>)
Sitka alder (<u>Alnus sinuata</u>)	Mockorange (<u>Philadelphus spp.</u>)
Elderberry (<u>Sambucus spp.</u>)	Arrowwood or moosewood (<u>Viburnum spp.</u>)
Manzanita (<u>Arctostaphylos spp.</u>)	Hawthorne (<u>Crataegus</u>)
Ninebark (<u>Physocarpus spp.</u>)	
Mountain mahogany (<u>Cercocarpus spp.</u>)	

* except P. emarginata

5. Monumenting information. Information on tree azimuth, distance, and tree number is used for relocating and remeasuring the tree. The tree number is also used as an identification number in data compilation.

a.) Item 5--Azimuth (AZM). 3-digit code describing the azimuth from point to tree. Printed or downloaded on the trackable tree tally record for remeasured trees; updated by field crew when the printed/downloaded azimuth is significantly different, or when the tree is a reference tree and a more accurately measured azimuth is required. Record to the nearest degree for all new tally trees. Code a north azimuth as "360."

b.) Item 6--Distance (DIST). 4-digit code indicating the distance, in centimeters, from the point to the head of the nail that affixes the tree number tag. Printed or downloaded on the trackable tree tally record for remeasured trees. Change the printed/downloaded code only on trees when the printed distance is significantly different, or when the tree is a reference tree and a more accurately measured distance is required. Record a 4-digit code for all new trees 12.5 cm dbh and larger.

c.) Item 7--Tree number (TRN). 3-digit code. Tree numbers of 001-999 are valid codes. Printed or downloaded on the trackable tree tally record for remeasured trees.

(1) Attaching tree number tags. All trees 12.5 cm dbh and larger that are part of the OCC 3 sample must be marked with an aluminum tree number tag.

Do not use the same tree number more than once on the same plot! Before leaving the vehicle, make sure the printed tree numbers for remeasured trees are not the same series as those you plan to use for new trees.

On remeasured trees, you may reuse the OCC 1 or 2 tree number tag or attach a new one. If you reuse the existing tag, make sure it is pulled out far enough so it will not be overgrown before OCC 4. If it is more convenient to attach a new tree number tag, make sure the OCC 2 tag is discarded. If you cannot remove the tag, pound it flush with the tree base, so it will be overgrown and not confused with the OCC 3 tree number tag.

All new trees (trees 12.5 cm dbh and larger tallied for the first time at OCC 3) must be marked with an aluminum tree number tag. Nail the tag to the tree below stump height, on the side of the tree facing the point. Drive the nail in only as far as necessary to firmly anchor it in the wood.

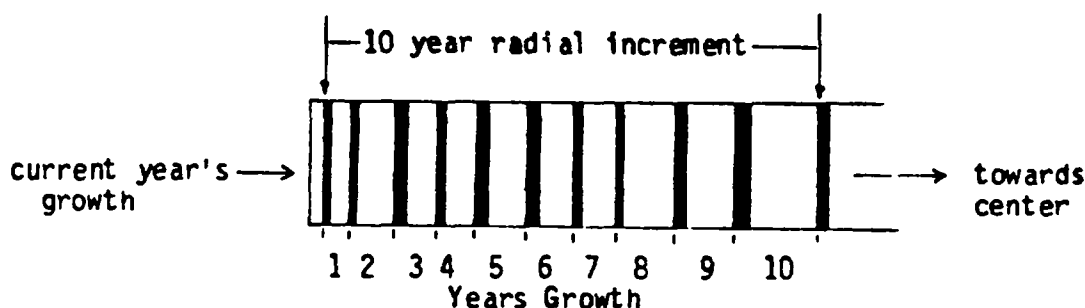
(2) Recording tree number. For remeasured trees 12.5 cm dbh or larger at OCC 2, this item is printed on the trackable tree tally record. Change the printed code if you attach a new tree number tag. For new trees and remeasured trees receiving a tree number for the first time, record a 3-digit code.

6. Item 8--OCC2 increment (OC2 INC). This item is printed or downloaded on the trackable tree tally record for all tally trees with an OCC2 increment. It is a 3-digit code indicating the OCC2 increment to the nearest millimeter.

7. Item 9--OCC2 dbh (OC2 DBH). This item is printed or downloaded on the trackable tree tally record for all OCC2 tally trees. It is a 4-digit code, indicating the OCC2 dbh to the nearest millimeter. Change the printed OCC2 dbh for trees whose OCC 3 dbh is suspiciously larger or smaller than the OCC2 dbh. OCC2 dbh MUST be completed for "missed" and reconstructed trees (TH 6) and all trees on N points (reconstructed points). Bore the tree and calculate the OCC2 dbh as explained in the following section. Do not bore hardwoods or trees that are <12.5 cm dbh at OCC3. Note: OCC3 dbh cannot be less than that at OCC2. If OCC2 dbh is changed, it is necessary to also check OCC1 dbh for reasonableness.

How to calculate OCC 2 dbh from measured increment:

- a.) Bore the tree just below breast height, on the side of the tree facing the point. If slope and tree size make this impossible, bore the tree on the side opposite the point.
- b.) Beginning at the outside (bark end) of the core, count the number of rings since OCC 2 (year of OCC 3 inventory minus year of OCC 2 inventory). Record the number of rings you counted in the remarks column.
- c.) Measure the length of this segment of the core to the nearest millimeter. Multiply this value, which is radial increment, by two to determine diameter increment. Record diameter increment in remarks column.
- d.) Multiply the diameter increment from step c. by 1.1 to adjust for bark growth.
- e.) To determine OCC 2 dbh, subtract the answer in step d. from the measured OCC 3 dbh.
- f.) Enter "bored increment" in the remarks column.



8. Item 10--OCC 3 dbh (OC3 DBH). Information on dbh is used in calculating volume, growth, and average stand diameter. It is also used in projecting mortality, cut, growth, and tree height. On full-remeasurement, reconstructed, and new plots (SK 1 - 6) measure diameters of all trees.

On walk-thru plots (SK 7), measure diameter on the following trees:

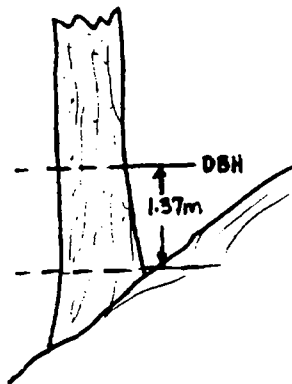
- * reference trees;
- * all trees on N points (i.e., moved, substituted or lost points which are reconstructed);
- * all trees with OCC2 dbh <12.5 cm;
- * all conifer trees with no OCC2 increment recorded;
- * all ingrowth trees (TH 4);
- * all missed (backdated) trees (also enter a backdated OCC2 dbh);
- * all trees with OCC2 dbh >12.5 cm on points 11 and 22, plus additional trees as needed to bring the total to 4 conifers that have an OCC2 increment and 4 hardwoods
- * all TH 7s (snags) (can be estimated).

a.) Recording dbh. Record a 4-digit code for live tally trees on new and new/remeasurement points. The code indicates the tree's dbh to the nearest millimeter.

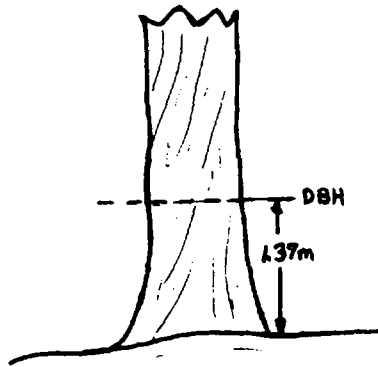
b.) Marking dbh. All trees 7.5 cm dbh and larger on N and N/R points must be marked with an aluminum nail at the height that dbh is measured. OCC2 tally trees were marked with a dbh nail. Mark the same spot with a new dbh nail. Remeasure dbh at the old d-nail regardless of how high or low it is (note in remarks the height at which dbh was measured if it was greater than 5 cm higher or lower than breast height--1.37m). If the OCC2 d-nail cannot be located, mark and measure the tree as noted below for new trees. On walk-through plots, add new nails if necessary.

Mark new trees 7.5 cm dbh and larger with an aluminum nail at breast height (1.37 m above ground level from the root collar, measured at the uphill side of the tree). Avoid irregularities in the bole when placing the nail (see following figure). If the tree has swellings, bumps, depressions, or branches at breast height, affix the dbh nail immediately above the irregularity, at a point where the stem has normal form. For trees that sprout from a stump, affix the diameter nail 1.37 meters above the point where the sprout leaves the stump. Note the height of the dbh nail in remarks if it is above 1.40 m or below 1.34 m. On level ground, affix the dbh nail on the side of the tree facing the sample point. On sloped ground, affix the dbh nail on the uphill side of the tree. Leave as much of the nail exposed as possible, making sure it is firmly affixed to the tree. If the tree is 75.0 cm dbh or larger, affix one additional dbh nail for every 30 cm of diameter, distributing the nails evenly around the circumference of the bole.

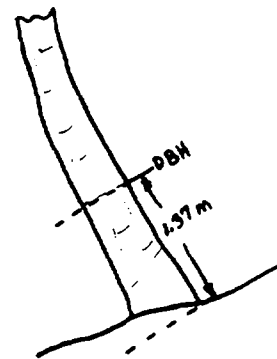
TREE ON SLOPE



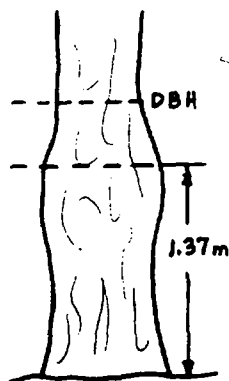
TREE ON LEVEL GROUND



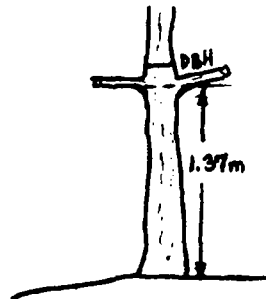
LEANING TREE



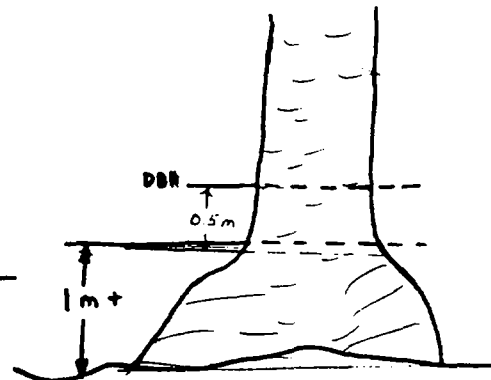
TREE WITH SWELL AT 1.37 m



TREE WITH BRANCH AT 1.37 m



BOTTLENECK TREE



c.) Measuring dbh. Measure dbh directly above the dbh nail. On trees without dbh nails (trees less than 7.5 cm dbh), measure dbh at a point 1.37 meters above ground level.

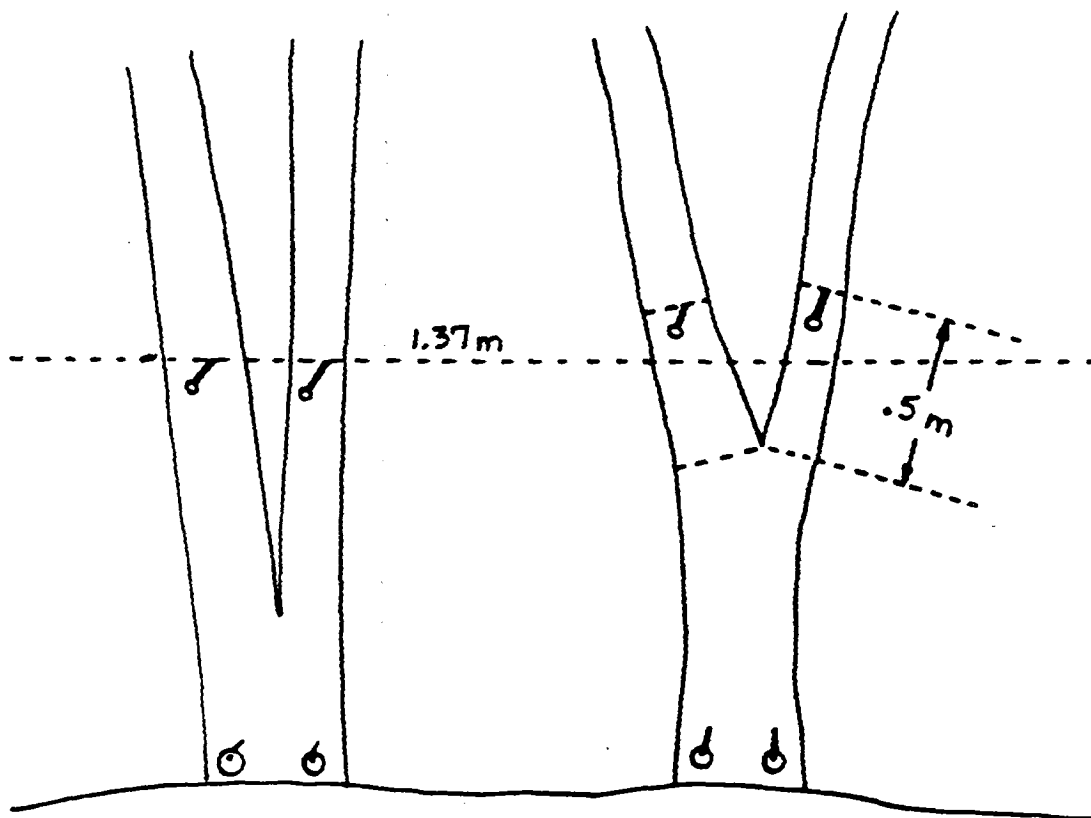
Before measuring dbh, remove any moss, poison oak or other vines, slugs, or anything else that may affect the diameter measurement. In addition, it may sometimes be convenient or necessary to remove a dead branch. Only chop off limbs if the accuracy and efficiency of the measurement would be increased. Never remove live limbs!

d.) How to measure dbh under special circumstances.

(1) Forked trees. Tally remeasured trees the same way they were tallied previously; if a tree was considered forked at OCC 2, consider it forked at OCC 3. Each fork that is 12.5 cm dbh or larger must be marked with a tree number tag on the side of the tree base where the fork occurs.

Crotch of fork at or above 1.37 m. Consider as a single tree. Measure diameter below the swell caused by the fork, but as close to 1.37 m as possible.

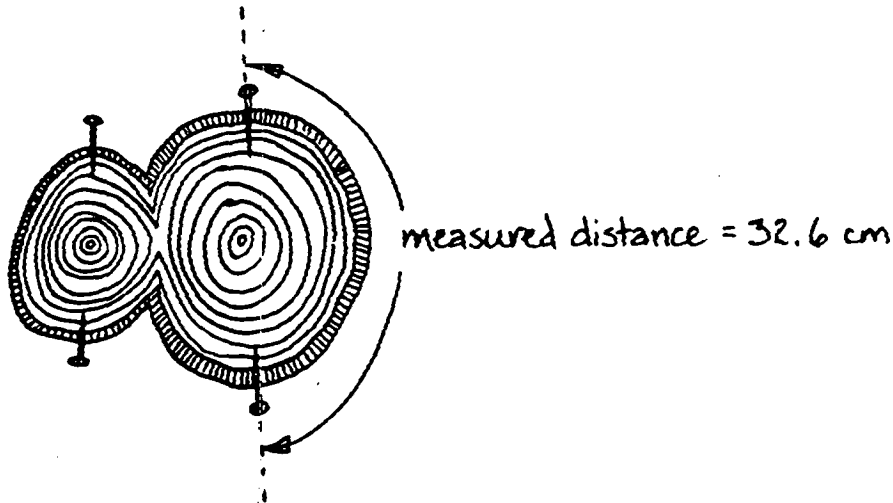
Crotch of fork below 1.37 m. Consider each fork as a separate tree. Measure diameter at 1.37 m above the ground or 0.5 m above the crotch of the fork, whichever point is higher on the tree. Forks are tallied with the prism if the fork is "in" where dbh is measured. Forks are tallied on the fixed-radius plots if the center of the tree at base is within the fixed-radius.





Measuring some dbh's can be a real bear.

(2) Trees that have grown together. When two closely-spaced trees grow together, they may have the appearance of a forked tree, but should be treated as separate trees. On each of the trees, affix two dbh nails halfway around the tree's circumference from each other. Measure the distance between the nails with a diameter tape. Multiply the measurement by two (2) to calculate dbh. Note "double nail dbh" in remarks column.



Example: Distance measured = 32.6 cm
 $32.6 \times 2 = 65.2$ cm
Code Item 9 "0652"

If the tree is a remeasurement tree that has grown together with another tree since OCC 2, you can bore the tree for increment and calculate the OCC 3 dbh if you think it will give a more accurate estimate.

(3) Impossible-to-measure trees. If it is physically impossible to measure the diameter of a tree with a diameter tape because of forking, huge root collars, etc., then estimate the diameter as follows.

- a. Determine where dbh should be measured. Mark the spot if possible.
- b. Using a prism as a guide, move to a point on the ground at which the tree becomes borderline.
- c. Measure the horizontal distance from this point to the center of the tree. This is the tree's limiting distance.
- d. Using the limiting distance table on p. 143, look up the diameter for this limiting distance.
- e. Record this diameter in Item 10 and note "estimated dbh" in the remarks column.

9. Item 11--OCC2 height (OC2 HT). 3-digit code, printed or downloaded on the trackable tree tally record. Indicates total height of the tree to the nearest decimeter. Estimated OCC2 heights end in "0". Do not change the printed/downloaded OCC2 code (not required on backdated trees).

10. Item 12--OCC 3 height (OC3 HT). 3-digit code indicating the tree's height to the nearest decimeter. For sample kind 1 - 7, record heights for the following:

- * all new trees (including ingrowth, missed, backdated, ongrowth, trees on new plots, trees on moved or substituted points (N points) on remeasurement plots);
- * all remeasured trees less than 12.5 cm dbh at OCC2; (not required on walk-thru plots SK 7);
- * all TH 7s (snags).

In addition, for each conifer species present on the plot, remeasure the height of the first tree that has a measured OCC2 height and has not lost its top since OCC2. If the OCC2 height proves invalid, go to the next tree. Also remeasure height of the first hardwood of any species that has a measured OCC2 height. If a species present on the plot has only estimated OCC2 heights, no OCC3 heights are required.

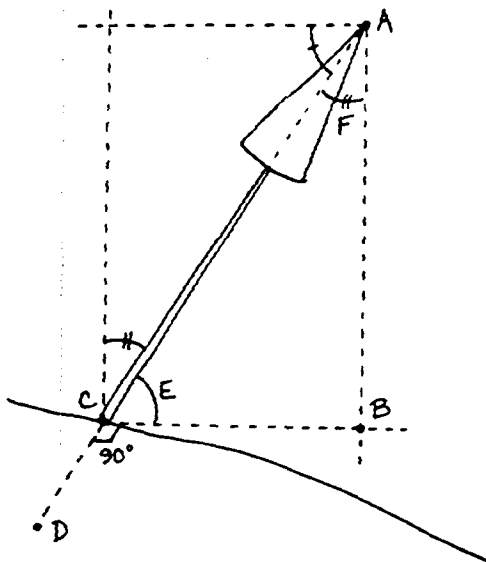
If the OCC3 height is less than the printed/downloaded OCC2 height, make sure the OCC 3 height is accurate. If it is, the Husky will note that you are aware of the discrepancy. Do not change the printed OCC2 height. Codes for measured heights may not end in zero. Codes for estimated heights, including estimated heights of deformed trees, must always end in zero.

Use the following guidelines for measuring or estimating tree heights.

- a.) Live, normally-formed trees. Measure or estimate total tree height. This is the distance from the base of the tree (on the uphill side) to the tip of the tree. A normally-formed conifer has a central bole and no deformities (such as a crook, fork, or missing top). A normally-formed hardwood has a complete bole with no missing top. Some hardwoods (e.g. alder and cottonwood) have a single bole to a forked crown. Others (e.g. oak, maple, ash, and madrone) typically fork much lower on the bole.
- b.) Live, "deformed" trees. Estimate a reconstructed tree height. This is what the total tree height would be without the deformity, usually by looking at normally-formed trees in the stand of the same species and dbh. Note the actual tree height in the remarks column.

c.) Leaning trees. Measure or estimate total bole length (from the base to the tip of the tree), not the elevation of the tip above the ground. To measure heights of leaning trees using a clinometer, follow these steps:

- (1) Move to a point along a line (point D) that is perpendicular to the plane in which the tree is leaning.
- (2) Using your clinometer, measure the height of point A above point B.
- (3) By standing at the base of the tree and sighting up the bole with your clinometer, measure the slope of the bole in degrees (the left side of the clinometer scale). (Angle E in the diagram below)



- (4) Subtract the degrees of lean (step c.) from 90 degrees. This gives you the degrees of angle F.
- (5) By sighting through your clinometer, convert the angle calculated in step d. to a percent.
- (6) Use the slope correction table in Appendix 6 to determine the expansion factor for the percent slope determined in step (5). Multiply the expansion factor by the measured distance from point A to point B (step 2.). This gives the length of the bole (point A to point C).

11. Item 13--Breast-high age (BH AGE). 3-digit code, indicating the tree's age at breast height. This variable is used in determining stand age, and in regression analyses for tree growth, cut, and mortality.

a. Remeasured trees. This item is printed/downloaded for all OCC2 trees. If the tree was bored for an exact age, the OCC 3 breast-high age has been calculated in the office and printed or downloaded on the trackable tree tally record, noted by an asterisk "*" beside it.

For trees whose age was estimated previously, the printed age was calculated by:

(1) Taking the midpoint of the tree's age group. (The OCC 2 age groups were 10-year classes up to age 200, 200-300 years, and 300+ years. Age at OCC 2 was total tree age).

(2) Subtracting the standard number of years the species requires to reach breast height.

(3) Adding the number of years since the previous inventory (OCC2).

Change the age if it was estimated at OCC2 and you bore the tree for an exact age at OCC 3. Record "Bored Age" in remarks (the husky will add an asterisk "*"). Do not change the printed/downloaded age of remeasured trees that have died or have been cut since OCC 2; age will be backdated in the office by computer.

b.) New trees. Record a 3-digit code for all live trees tallied. The code indicates the tree's breast-high age to the nearest year. The ages of trees may be estimated, especially those 200 years old or older.

Bore representative trees of the various species and age groups present in the plot area. Estimate the age of the remaining trees using the bored ages as a guide. After boring the tree for age, leave the extracted increment core at the base of the tree (for the convenience of the check-plotter!).

c. Determining breast-high age of large trees. To determine the age of a tree whose radius is greater than the length of the increment borer, use the following procedure:

(1) Bore into the tree as far as possible, extract the core, and count the rings.

(2) Count the number of rings in the inner 5 cm of the core.

(3) While the increment borer is still in the tree, measure the length of the borer that is exposed.

(4) Subtract this length (3) from the total length of the increment borer.

(5) Divide the tree's dbh by 2.

(6) Subtract (4) from (5). This gives you the distance by which you are short of reaching tree center.

(7) Divide this number (6) by 5. This tells you how many 5-cm lengths you were short by.

(8) Multiply this number (7) by the number of rings in inner 5 cm (2).

(9) Add this number (8) to the total number of rings in the extracted core (1). This is the tree's estimated breast-high age.

(10) Note "extrapolated age" in the remarks column.

Example: Determine the age of a 148.8-cm Douglas-fir. The core has 110 rings, and has 10 rings in the inner 5 cm. 2 cm of the 41-cm-long increment borer did not penetrate the tree. Each number below is associated with its corresponding step above:

1.) 110

2.) 10

3.) 2

4.) $41 - 2 = 39$

5.) $148.8/2 = 74.4$

6.) $74.4 - 39 = 35.4$

7.) $35.4/5 = 7.1$

8.) $7.1 \times 10 = 71$

9.) $110 + 71 = 181$ years breast-high

12. Item 14--OCC2 crown ratio (C). 1-digit code printed/downloaded by computer for all live trees tallied at OCC 2. Use same codes as for OCC 3 crown ratio (Item 15). Change the printed/downloaded code if it is obviously incorrect. Note: The Husky will alert you if the OCC3 crown ratio is different by 2 or more classes and ask if a change is desired.

13. Item 15--OCC3 crown ratio (R). Record a 1-digit code for all live trees tallied. Compare estimate with the OCC2 code for reasonableness and continuity.

Code Percent live crown

1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81+

Crown ratio is the percent of the tree's total height that supports living crown. The tree's total height includes dead, broken, or missing portions of the tree. For trees of uneven crown length, ocularly transfer lower branches on the fuller side to fill holes on the sparse side until a full, even crown is created. Base your estimate on this "created" crown.

Crown ratio is one indicator of a tree's vigor. In data analysis, trees with a crown ratio of 30 percent or less are considered less vigorous. For this reason, be particularly careful when deciding between codes "3" and "4." You may want to use your clinometer to measure live crown ratios on these trees.

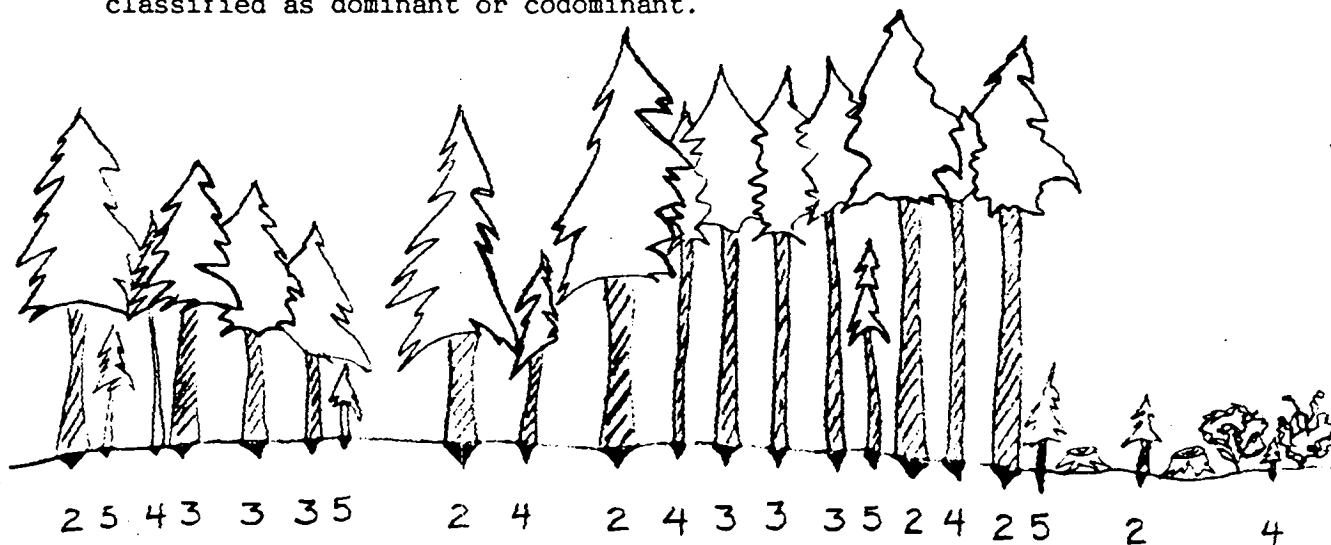
14. Item 16--OCC2 crown class (C). 1-digit code, printed/downloaded by computer for all trees tallied at OCC 2. Use the same codes as for OCC 3 crown class (Item 17). Change the printed/downloaded code if it is obviously incorrect.

15. Item 17--OCC 3 crown class (C). Record a 1-digit code for all live trees tallied. Be sure to compare your estimate with the OCC 2 code for reasonableness and continuity. Crown class describes the tree's position in the stand; it indicates how well the tree is competing for light. This variable identifies trees that are "free-to-grow," and is used in growth projections. Crown classes are described and coded as follows:

<u>Code</u>	<u>Crown class</u>	<u>Description</u>
2	Dominant	Crown extends above the general level of the canopy; it receives full light from above and some direct light from the sides. (Includes open-grown trees.)
3	Codominant	Crown is part of the general level of the canopy; it receives full light from above but little light from the sides. Crown is usually medium-sized and somewhat crowded by other trees.
4	Intermediate	Tree is shorter than dominants or codominants; crown is below or barely reaches into the main canopy formed by dominant and codominant trees. Crown receives little direct light from above and none from the sides. Crown is usually small and quite crowded against other crowns.
5	Overtopped	Crown is entirely below the general level of the canopy; it receives no direct light from above or from the sides.

These codes are easily applied in even-aged stands. Classification is more difficult in uneven-aged stands or in areas where more than one stand is present. In these situations, classify the tree based on its immediate environment. In other words, base your classification on how much light the tree's crown is receiving. The intermediate and overtopped crown classes are meant to include trees seriously affected by direct competition with adjacent trees.

For example, a young, vigorous tree that is considerably shorter than other trees in the stand--but that is not overtopped by other trees and that receives full light from above and partly from the side--is classified as dominant. The same principle applies to two-storied stands: understory trees should only be assigned subordinate crown classes if they are adjacent to overtopping trees. In areas with scattered residual overstory trees over younger trees, a considerable portion of the understory trees will be classified as dominant or codominant.



Crown class illustration using codes

16. Item 18--Growth impactor. Record a 2-digit code for all live trees tallied. Code growth impactors as defined on the following pages.

If a damage code was recorded by the field crew at OCC 2, the code has been converted to the appropriate OCC 3 growth impactor code and printed in this item. If the tree is now dead or cut, do not change the printed/downloaded code. If the tree is still alive, change or delete the printed/downloaded code in accordance with the current coding rules.

If the tree was a snag tallied at OCC 2, the OCC 2 code (92-95) will be printed/downloaded. Do not change the code. (See chapter X, p. 128)

Code this item other than "00" only when the tree meets the criterion for the particular factor being considered. Codes and explanations follow.

<u>Code</u>	<u>Growth Impactor</u>
00	None
11	Bark beetles
12	Defoliators
13	Balsam woolley aphid
14	Terminal feeders
15	Spruce budworm
21	Laminated root rot
22	Armillaria root rot
23	Blackstain root disease
24	Annosus root disease
26	Dwarf mistletoe
27	Other diseases and rot
30	Fire
40	Animal
50	Weather
60	Suppression
70	Excessively deformed sapling
80	Release
90	Other damage

Code Descriptions of growth impact factors.

- 11 Bark beetles. Code "11" when bark beetle damage is present on the tree.
- 12 Defoliators. Code "12" when defoliating insects or their damage is present on the tree.
- 13 Balsam woolley aphid. Code "13" when Balsam Woolley aphid damage is present on the tree.
- 14 Terminal feeders. Code "14" when terminal feeding insect damage is present.
- 15 Spruce budworm. Code "15" when Spruce budworm or their damage is present on the tree.
- 21 Laminated root rot. Code "21" when Phellinus weirii is present in the tree. All conifers are susceptible; most common in true-fir, Douglas-fir, and hemlock.
- 22 Armillaria root rot. Code "22" when Armillaria (mellea) ostoyae is present in the tree. Conifers AND hardwoods are susceptible.
- 23 Black stain root disease. Code "23" when Ceratocystis (Verticicladiella) wagnerii is present in the tree. Most common in Douglas-fir; occasionally hemlock and pine.
- 24 Annosus root disease. Code "24" when Fomes (Heterobasidion) annosus is present in the tree. Most common in true-fir and pine.
- 26 Dwarf mistletoe. Code "26" if dwarf mistletoe (Arceuthobium spp) is the most important growth impactor and will kill the tree in 10 years, or has killed the tree.
- 27 Other diseases and rot. Code "27" when any disease not previously listed will prevent the tree from surviving 10 more years. May include: cankers; conks on tree or on ground near tree (e.g. Phaeolus schweinitzii, Phellinus pini); wilts; dry rot associated with sunscalds and mechanical damage; scabs and leaf galls; diebacks. Note the kind of disease in remarks.
- 30 Fire. Code "30" when damage to the tree from fire will prevent the tree from surviving 10 more years. Ignore basal scars unless they have girdled enough of the cambium to kill the tree. If foliage has been killed by fire, do not code fire damage unless foliage in the upper one-third of the crown has been killed.
- 40 Animal. Code "40" when damage caused by animals will prevent the tree from surviving 10 more years. Also code "40" for trees less than 12.5 cm dbh that are heavily browsed (this is used to predict growth).

- 50 Weather. Code "50" when damage caused by weather will prevent the tree from surviving 10 more years. Examples of when to code: most of crown has been lost due to wind or snowbreak; bole has been shattered by lightning; tree has been partially uprooted by wind (and tree does not have root rot).
- 60 Suppression. Code "60" when overtopping by other trees will prevent the tree from surviving 10 more years, or prevent a sapling from attaining 12.5 cm dbh. Suppressed understory trees are common in old-growth stands. They may also occur in second-growth timber, or as residual trees after logging. Suppressed trees are usually characterized by extremely short or nonexistent internodes; twisted, gnarled stems; short, flat crowns that form an "umbrella"; or extremely sparse foliage.
- 70 Excessively deformed sapling. Code "70" for trees 2.5-12.4 cm dbh that will never produce a minimum log. (A minimum log is 2.5 m for hardwoods and 3.8 m for conifers.)
- 80 Release. Code "80" if the density of surrounding trees has been substantially reduced, thereby increasing the tree's growing space. This item is used in growth projections.
- 90 Other damage. Code "90" if any damaging agent not listed above will prevent the tree from surviving 10 more years. These may include: mechanical injuries (natural or due to human activity such as logging); chemical damage; trees dying of an unidentifiable cause. Note the kind of damage in remarks.



"Here, Fill C'mon! ... Faster, Fill!"

A. - GUIDE FOR IDENTIFYING INSECT DAMAGE

Bark beetles: Code whenever present.

Hosts: All conifer species.

Damage characteristics: Can be recognized as follows:

On Douglas-fir: needles turning yellow or red over most of tree (tree is dying); conspicuous boring dust in bark crevices; black pitch streaks in bark over much of bole.

On pines: needles turning yellow to red over most of tree or small yellow to red pitch tubes (< 1 cm dia.) along bole; reddish boring dust in bark flakes and crevices, or around base of tree; gallery patterns under bark.

Defoliators: Code whenever present.

Hosts: All conifer species.

Damaging characteristics: Needles showing signs of insect feeding and various stages of discoloration; insects (caterpillar scales or aphids) could be present in early spring and early summer; webbing may be present on needles; needles may be mixed (hollow and/or yellow to light green); needles sparse on branch tips and top of crown; branches with no new shoot growth; leader deformed or killed.

Terminal Feeders: Code whenever present.

Hosts: Ponderosa and lodgepole pine, 1 to 6 meters tall.

Damage characteristics: Current terminal leader or tip may be curled; shorter terminal (both total length as well as needle length) than lateral branches at first whorl; or dead (with or without needles).

Balsam woolly aphid: Code whenever present.

Hosts: All True firs.

Damaging characteristics: Gouting (knobby swellings on end of twigs and internodal branches); branches dead or dying; woolly or cottony masses on bole; severe pitching on main bole of grand fir.

17. Item 19--Cause of death/Use or Circumstances of disappearance (D/U).

Record a 2-digit code for trees tallied as alive and 2.5 cm dbh or larger at OCC 2 that are now dead (Item 3, tree history, is coded "5"). This item must be coded on all new/remeasured points; it indicates the cause of death. Use the same codes as for growth impact factor (Item 18), excluding codes 70 and 80. Data from this item explains the causes of tree mortality in the inventory unit. If the tree is a snag, this item refers to Use or Circumstances of disappearance--(See chapter X, p. 128).

18. Item 20--Dwarf mistletoe (M). 1-digit code required for all live tally conifers. The code indicates the degree of infection of dwarf mistletoe. This item is used in describing the extent and severity of mistletoe infection in the sample area.

This item is printed/downloaded for all conifers tallied as alive at OCC 2. If the tree is alive at OCC 3, change the printed/downloaded code if it is inaccurate. If the tree is now dead, do not change the printed/downloaded code. Code as follows:

Trees 2.5 - 7.4 cm dbh

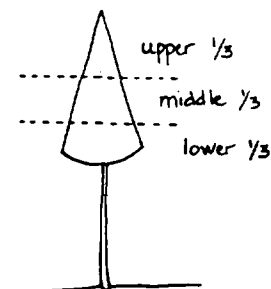
Code Description

- 0 No mistletoe infection.
- 1 Mistletoe infection in either upper or lower half of crown, but not in both. No brooms.
- 2 Mistletoe infection in both upper and lower halves of crown, or with one or more brooms anywhere in the crown.

Trees 7.5 cm dbh and larger

"Score" the mistletoe code as follows:

- a.) Visually divide the live crown into thirds:
- b.) Score infections in each third as follows.



Score Description (A bole infection counts as a branch infection.)

- 0 No infection.
 - 1 Less than 50 percent of the branches infected; no brooms.
 - 2 50 percent or more of branches infected; or one or more brooms.
- c.) Sum the scores for each third. Code the total.

Example: A tree has no infection in top third of crown, light infection in the middle third, and has two brooms in the lower third.

The total score is: $0 + 1 + 2 = 3$; the code is: "3"

19. Item 21--Bigleaf maple clump (CL). Record a 1-digit code for all bigleaf maple tallied. The code indicates whether the tree is in a clump. Each fork of a forked tree counts as one stem and must be entered on a separate line. Clump data are used in adjusting stocking estimates; trees growing in clumps contribute less stocking than those growing as individuals.

<u>Code</u>	<u>Description</u>
0	Bigleaf maple IS NOT in a clump.
1	Bigleaf maple IS in a clump.

A clump is defined as 3 or more bigleaf maple stems originating from a root system from a tree now gone. Bigleaf maple clumps typically arise from old stumps that are left from cutting or from natural mortality.

20. Item 22--Cull other. Record a 2-digit code for all live trees ≥ 12.5 cm dbh and trees ≥ 12.5 cm at OCC2 that are now dead, cut, or culturally killed (TH 3,5,8). This item indicates the percent, to the nearest 10 percent, of the volume that is lost due to broken or missing parts, forks, or crooks. Code only when 1 meter or more of the tree is defective. Information on cull other is used in calculating net tree volume.

If the conifer does not have a minimum log (3.8 m), code this item "99."

If the hardwood does not have a minimum log (2.5 m), code this item "99."

Remeasured trees. For conifers tallied as alive and 12.5 cm dbh or larger at OCC 2, this item has been printed/downloaded by computer. Use the printed code only as a guide. Determine percent cull according to the current rules (see below), and correct the printed code if necessary. Do not cull for hardwood forking. For trees that are now dead or cut, cull other indicates the cull at the time of the OCC 2 inventory.

Use the following guide, and tables showing merchantability standards and percent distribution of volume by log, to determine percent cull other. Note the cause of the volume loss in the remarks column.

Top out. Cull one meter below the break for splintering, plus the entire top above the break.

Fork.

(1) When the crotch of the fork is below 1.37 m, treat as separate trees with no cull.

(2) When the crotch of the fork is above 1.37 m, cull only if additional volume in a second stem does not compensate for the volume reduction in the main stem. Forked trees often have as much or more volume than trees without forks.

Merchantability Standards

	Size class (cm)	Stump height (cm)	Log length (m)	Minimum top diameter outside bark (cm)
SAWTIMBER:				
Conifer	22.5+	45	5.0	18
Hardwood	27.5+	45	2.5	23
POLETIMBER:				
Conifer	12.5-22.4	30	2.5	10
Hardwood	12.5-27.4	30	2.5	10

Percentage distribution of total tree volume
for sawtimber conifers (22.5 cm dbh and larger)

(5-meter logs)

Tree height (in logs)	Log number											
	1	2	3	4	5	6	7	8	9	10	11	12
1	100											
2	70	30										
3	55	35	10									
4	41	31	20	8								
5	32	27	21	14	6							
6	27	23	19	15	11	5						
7	23	20	17	15	12	8	5					
8	20	18	16	14	12	9	7	4				
9	17	16	15	13	11	10	8	6	4			
10	16	15	13	12	11	10	8	7	5	3		
11	14	13	13	11	11	10	8	7	6	4	3	
12	14	13	12	11	10	10	8	7	6	4	3	2

Percentage distribution of total tree volume
for hardwoods and poletimber conifers (conifers 12.5-22.4 cm dbh)

(2.5 m logs)

Tree height (in logs)	Log number									
	1	2	3	4	5	6	7	8	9	10
1	100									
2	55	45								
3	41	33	25							
4	33	28	22	17						
5	28	24	20	16	12					
6	25	22	18	15	12	8				
7	22	20	17	14	12	9	6			
8	20	18	16	14	11	9	7	5		
9	18	17	15	13	11	9	7	6	4	
10	17	16	14	12	10	9	8	6	5	3

21. Item 23--Cull rot category (CR). Record a 1-digit code for all tally trees 12.5 cm dbh and larger except snags and reference trees (tree history 7 and 9). Cull rot is downloaded for remeasurement trees. The code indicates the broad decay category of the tree, as described below.

<u>CODE</u>	<u>CULL ROT CATEGORY</u>
-------------	--------------------------

0	0-9
1	10-32
2	33-74
3	75-100

Information on cull rot is used with information on cull other (Item 22) to calculate the net volume of trees.

Trees without computer printed cull rot codes. Base the code for cull rot category on visible indicators of cull, using the log lengths and percent distribution tables in the previous section. Follow these steps in coding this item:

Code 3

--Trees with conks along entire bole or otherwise visibly totally rotten

Code 2

--Western hemlock with any conks present
--Douglas-fir >140 years with Phellinus pini conks
--Douglas-fir with conks other than "pini" or Polyporus schweinitzii
--Other conifers with conks other than "schweinitzii"

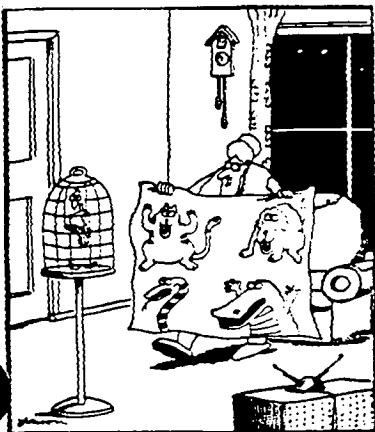
Code 1

--Douglas-fir less than 140 years with "pini" conks
--Conifers with "schweinitzii" conks (except western hemlock)

Cedar

--Use visible indicators to estimate cull category. Most cedar has some cull in the butt log. Look for unusual flare in the butt log and check for hollowness. When a tree bears a dry side, (no bark, wood exposed) look for a brown cubical rot and check for hollowness.

[this page for notes]



"Bedtime, Leroy. Here comes your animal
blanket."

IX. STOCKING TREE TALLY

TABLE OF CONTENTS

	PAGE
VIII. STOCKING TREE TALLY	118
Objectives.	119
Layout and numbering of stocking points	119
Special considerations for laying out stocking points	120
Tree selection--3.3-m fixed-radius plot	120
Tree identification and measurement	122
Item 1--Line number	122
Item 2--Point number	122
Item 3--Species	122
Item 4--OCC3 diameter	122
Item 5--OCC3 height	122
Item 6--Breast-high age	122
Inhibiting vegetation on stocking points	123

VIII. STOCKING TREE TALLY

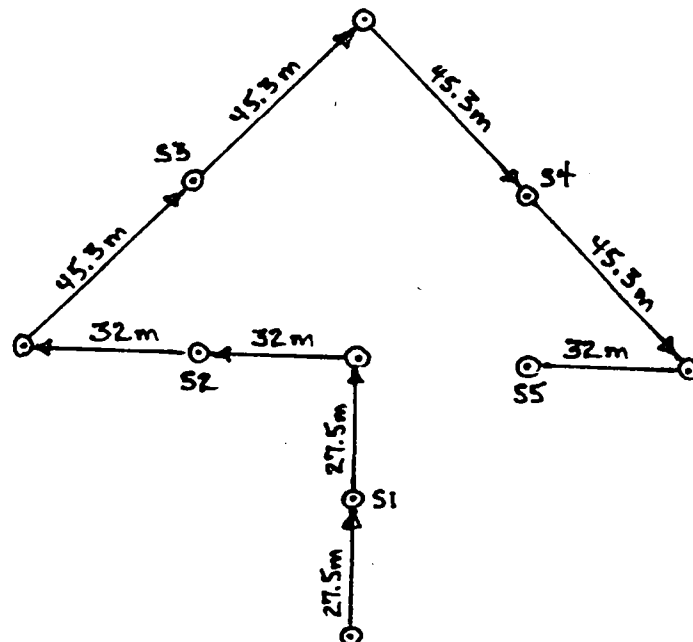
A. Objectives.

Information on tree stocking is used in evaluating opportunities for silvicultural treatment. Data on stocking are collected on plots of sample kind 1,3,5. An adequate sample of young stands requires a larger fixed-radius plot and more sample points than provided by the standard 5-point layout.

In some cases a field-determination of whether to collect stocking data is needed (on new plots, reconstructed plots, and plots that have been clearcut since photography. Collect stocking data (and code sample kind accordingly) when the average stand diameter is <20 cm, and virtually all OCC3 tally trees are 3.3-m fixed-radius trees.

B. Layout and numbering of stocking points.

Stocking is measured on 10 sample points: 5 permanent sample points (N and N/R) and 5 temporary stocking points. S-points are located midway between the permanent points, and measured as the plot is being laid out. In numbering these points, the first digit is an "S" for stocking and the second digit is a 1,2,3,4 or 5. Stocking points that coincide with permanent sample points are identified with the permanent point number. The following diagram shows the location of the temporary S-points for the standard 5-point plot layout.



Special considerations for laying out stocking points.

When permanent sample points are substituted, establish S-points midway between the substituted point and the point from which you are traveling. Indicate the location of the S-point on the plot diagram.

If any portion of the 3.3-m fixed-radius plot is nonstockable (see definition on p. 69), the 3.3-m fixed-radius plot must be moved.

On stocking points that coincide with permanent sample points (11-55, N1-N5), move the 3.3-m fixed-radius plot only; do not move the permanent sample point. As when moving sample points away from boundaries with different land classes and stand conditions (see p. ?), move the plot in a direction directly away from the nonstockable area(s) and in a direction that will minimize the distance moved. Move the plot only as far as is necessary to exclude all nonstockable area from the 3.3-meter fixed-radius plot. Although the moved stocking point no longer coincides exactly with the permanent sample point, it should still be numbered with the permanent point number. Indicate on the plot diagram that the stocking point has been moved.

On temporary, stocking-only points (S1, S2, S3, S4, or S5), use the same instructions as above for moving points. Make sure you return to the original line of travel before resuming travel to the next point.

C. Tree selection--3.3-m fixed-radius plot.

Record each tree separately. Record a maximum of eight "free-to-grow" trees on each point. Use the following rules for "free-to-grow" trees:

- 1) Count only those trees that are not "residual overstory" trees (sawtimber trees that are over 50 yrs old).
- 2) Count only those trees that are "in" on the 3.3-m fixed-radius plot (the tree's "center at the base" is within 3.3 horizontal meters of point center--see figure on p. 86).
- 3) Count only those trees that are expected to live at least 10 more years.
- 4) If the tree is a conifer, count it only if it will not be overtopped and shaded by another conifer before reaching 22.5 cm dbh.
- 5) Count trees that are dominant or codominant and that are breast height (1.37 m) or taller (regardless of whether they are 0.5 meters from other "countable" trees).
- 6) If a tree is not dominant or codominant and at least 1.37 m tall, it must be at least 0.5 meters from any other "countable" conifer tree to be counted. If two or more trees are closer than 0.5 m from each other, only one of them is "countable".

The "free-to-grow" condition of trees can be estimated by the "inverted cone" method. This method projects two straight lines along the branch tips of a tree's cone-shaped crown upward from their intersection at the tree's tip to create an imaginary cone, or funnel, in the growing space above it as shown in the figure below. If one-third of the imaginary cone is invaded by a conifer canopy, the tree is considered to be threatened or overtopped. If there is less vegetative competition than this, the tree is considered "free-to-grow". (See rule (4), p. 120).



7) Only one tree in a bigleaf maple clump is "countable". Count the best "in" tree--the one most likely to dominate the other trees in the same clump. This is usually the tree of greatest height and dbh, and straightest bole. (A clump is defined as 3 or more stems originating from the same root system. The root system developed as part of a tree which is no longer on the site due to harvesting or natural death).

8) Tally trees with the following species priority.

- a. Conifer other than cedar or pacific yew
- b. Cedar
- c. Red alder or cottonwood
- d. All other hardwoods (Do not tally yew, dogwood, or sp. 999).

Within species groups, tally in order of dominance.

Data recording. Record a line for each tree. A maximum of 8 "free-to-grow" trees can be recorded on each point. Each tree will be recorded on a separate line, and receive its own dbh (estimated or measured, to nearest cm) height (estimated or measured to nearest dm), and breast-high age. If no stocking trees are tallied on the point, record one line with the point number and "no tally".

D. Tree identification and measurement.

1. Item 1--Line number (LINE). 5-digit code generated by the Husky and will not be changed by the field crew.
2. Item 2--Point number (PT). Record a 2-digit code for each tree. On the five permanent points on which stocking data are collected, use the same codes as for trackable trees (see item 2 p. 91). On the additional stocking-only points, the first digit is an "S" and the second digit is (1-5).
3. Item 3--Species (SPC). Record a 3-digit code for each tree, using the same codes as for trackable trees (see item 4, p. 94).
4. Item 4--OCC3 Diameter (OC3 DBH). Measure or estimate diameter at breast height to the nearest mm. Record a 4-digit code for each tree, as for trackable trees.
5. Item 5--OCC3 Height (OC3 HT). Measure or estimate height to the nearest decimeter. Record a 3-digit code for each tree, as for trackable trees.
6. Item 6--Breast-high age (BH AGE). Record a 3-digit code for each tree, as for trackable trees. For tally trees less than 1.37 m in height, record an age of "0".

E. Inhibiting vegetation on stocking points. Complete this item for all plots with 3.3-meter fixed radius stocking plots (SK 1,3,5). Information on the shading of conifers by inhibiting vegetation is used in the analysis of silvicultural treatment opportunity. Regeneration stands that are stocked with inhibiting vegetation are identified as opportunities for release treatment. Nonstocked areas with inhibiting vegetation are identified as opportunities for cleaning operations.

1. Point number. Record the 2-digit code for each point where a 3.3-m fixed-radius stocking plot is measured.

2. Inhibiting vegetation. Record a 1-digit code that describes the condition of the 3.3-m fixed-radius stocking plot.

If conifers are tallied on the 3.3-m fixed radius points record one of the following:

<u>Code</u>	<u>Description</u>
-------------	--------------------

- | | |
|---|--|
| 1 | 50 percent or more of the conifers tallied are threatened or overtopped by hardwoods <17.5 cm dbh (one-third or more of the imaginary cone is invaded) or by nontree vegetation (two-thirds or more of the imaginary cone is invaded). |
| 2 | Less than 50 percent of the conifers tallied are threatened or overtopped by hardwoods or nontree vegetation (as defined above). |

If no conifers were tallied on the 3.3-m fixed-radius plot, record one of the following:

- | | |
|---|--|
| 3 | 50 percent or more of the 3.3-m fixed-radius plot is shaded by hardwoods less than 17.5 cm dbh or by nontree vegetation. |
| 4 | Less than 50 percent of the 3.3-m fixed-radius plot is shaded by hardwoods less than 17.5 cm dbh or by nontree vegetation. |

Insert on page 123

F. Precommercial thinning on stocking points. Complete this item for all plots with 3.3-meter fixed radius stocking plots. (SK 1,3,5). This item is used in assessing past treatment.

The Husky will ask, "Are stumps of trees precommercially thinned since OC2 present on the 3.3-m plot?" Crew will enter "Y" (yes) or "N" (no). The stumps need not be tally trees.

New edit check: If the plot is coded as PCT since OC2, either one or more TH3 must be tallied on the plot OR one or more point must be coded "Y" for PCT stumps present.

IX. SNAG TALLY

TABLE OF CONTENTS

	PAGE
IX. SNAG TALLY	124
Objectives	125
When to collect snag data	125
Tree selection--7 M BAF prism tally/17-meter fixed-radius plot	125
Tree identification and measurement	126
Item 1--Line number	126
Item 2--point number	126
Item 3--Tree history	126
Item 4--Species	126
Item 5--Azimuth	126
Item 6--Distance	126
Item 9--OC2 dbh	126
Item 10--OC3 dbh	126
Item 11--OC2 height	127
Item 12--OC3 height	127
Item 18--Growth Impactor	128
Item 19--Cause of death/Use or Circumstances of disappearance	128
Item 24--OCC 3 Decay class	129
Chracteristics of Douglas-fir snags by decay class	130

IX. SNAG TALLY

A. Objectives. Snags are an important special habitat feature for many species of wildlife. Snag data collected in western Washington will be used in:

- (1) Evaluating current forest conditions--How do snag populations vary as a function of plant community, successional stage, and disturbance history? How well do current snag conditions meet the needs of snag-dependent wildlife?
- (2) Studying how snags change over time--How fast are snags being recruited? What kind of trees are being recruited (species, age, growth impactors, cull, size, etc.)? How fast do standing dead trees decay? At what rate do they disappear, and what causes their disappearance (natural decay processes, firewood use, etc.)?

B. When to collect snag data. Collect data on all timberland plots (sample kinds 1 - 7). On all new sample points (N points), tally all snags that are "in" with the 7M BAF prism/17-m fixed-radius plot and are at least 22.5 cm dbh and 2.0 m tall at OCC3. On N/R points account for all snags tallied at OCC2 and tally any trackable trees from the OCC2 inventory that have since died (TH 3 or 5) and are now at least 22.5 cm dbh and 2.0 m tall.

C. Tree selection--7 M BAF prism tally and 17-meter fixed-radius plot.

(1) On N/R points, account for all snags tallied at OCC 2. In addition, all trackable trees from the remeasurement tally that are now dead (tree history 3 or 5) and that meet minimum size specifications (22.5 cm dbh, 2 m tall at OCC 3) will be added to the snag tally.

(2) On N points on new plots (SK 5,6), snags will be tallied by the same selection rules used at OCC2:

(a) Tally snags include all standing dead trees that are leaning less than 45 degrees from vertical. They may be either (1) self-supporting, by the tree's root system, or (2) supported by another tree or other object ("leaning"). Snags include stumps of harvested trees that meet the tree selection criteria.

(b) Snags must be at least 22.5 cm in dbh and at least 2 m tall at OCC3 to be tallied.

(c) Tally snags 22.5-90.0 cm dbh with the 7M BAF prism; snags ≥ 90.0 cm dbh are tallied on a 17 m fixed-radius plot.

(3) On N points on SK 1,2,3,4,7 (reconstructed points), tally all "in" snags as described above for SK 5,6. In addition, trackable trees tallied as TH 3 or TH 5 should be entered again as a TH 7 if they qualify as a snag. Also, record a line for trees believed to have been tallied as snags at OCC2 that are "now gone".

Data recording. Record one line for each snag tallied, completing data items as indicated in the tally guide below. For remeasured snags, the OCC 2 data are already printed/downloaded.

D. Tree identification and measurement.

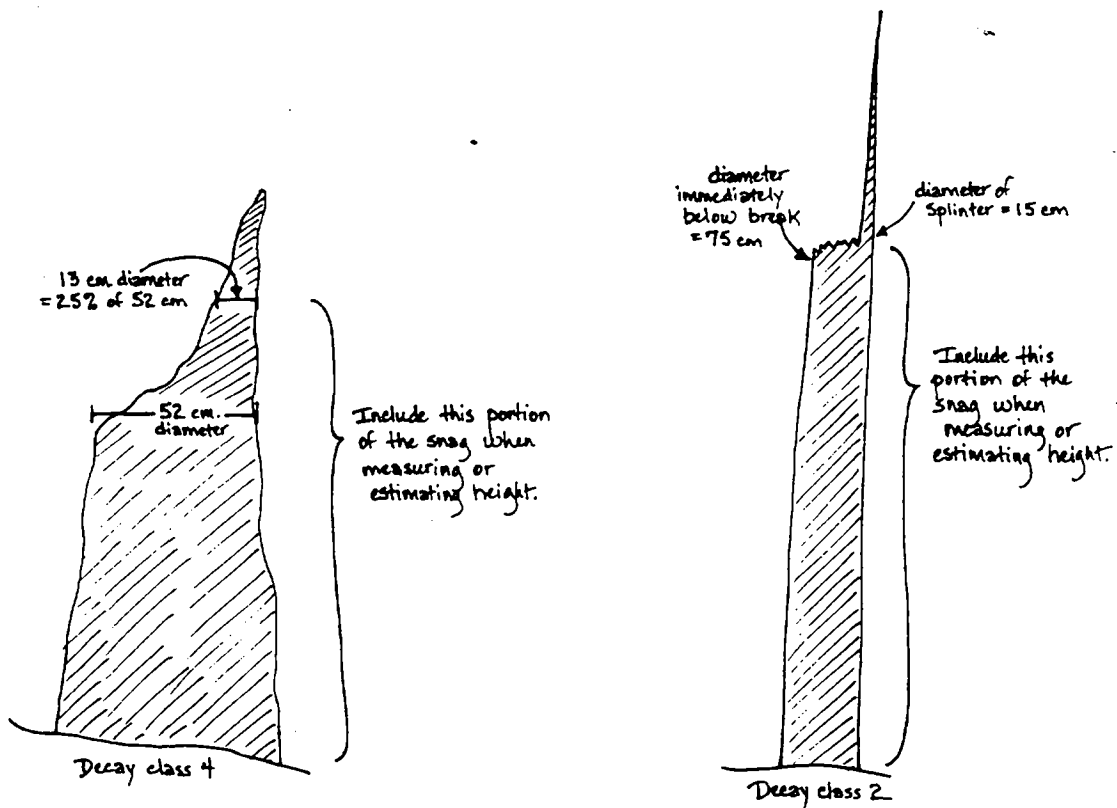
1. Item 1--Line number (LINE). 5-digit code printed/downloaded for OCC 2 tally snags. For new snags (snags that were live tally trees at OCC2), enter the same line number used for the corresponding TH 3 or 5.
2. Item 2--Point number (PT). Record a 2-digit code for all snags, using the same codes as for trackable trees.
3. Item 3--Tree history (TH). Record a 1-digit code for all snags. The tree history will be 7 for all snags currently present on the plot and snags that were tallied at OCC 2 but are now "gone".
4. Item 4--Species (SPC). Record a 3-digit code for all snags, using the same codes as for trackable trees (see Item 4, p. 94). Even if species identification is difficult or uncertain due to decay, make an "educated guess" if possible. In particular, it is important to distinguish hardwoods from conifers. The snag's bark (either attached or sloughed and laying beside the snag) and the branching pattern (if branches are still present) may provide clues to its species. If you absolutely cannot identify the species of a snag, record "999" (species unknown). Snags tallied at OCC 2 will have a species printed. If incorrect, update.
5. Item 5--Azimuth (AZ). Record a 3-digit code for all snags, using the same codes as for trackable trees (see Item 5, p. 95). Update OCC 2 entries if incorrect.
6. Item 6--Distance (DIST) (CM). Record a 4-digit code for all snags, using the same codes as for trackable trees (see Item 6, p. 95). Update OCC 2 entries if incorrect.
7. Item 9--OCC2 dbh (OC2 DBH) (MM). Printed/downloaded as a 4-digit code for snags tallied at OCC 2. Update, if necessary, to insure that the OCC 2 dbh is never smaller than the OCC 3 dbh.
8. Item 10--OCC3 dbh (OC3 DBH) (MM). Record a 4-digit code for all snags (except "gone" snags with a disappearance code of 2-6), indicating the snag's current dbh to the nearest millimeter. Snag dbhs may be estimated or measured. Measure or estimate dbh at a point 1.37 m above ground level, as for live trees. The recorded dbh indicates the diameter of existing material. Do not adjust the diameter for missing bark or chunks of wood.

Unlike living trees, snags can shrink (not grow) in dbh over time! If the OCC3 dbh is larger than the OCC2 dbh, double check (i.e. measure) the snag's current dbh--then record the measurement. If the OCC2 dbh is smaller, correct it to read the same as the OCC3 dbh. These situations may be attributed to the fact that OCC2 snag diameters were often estimated.

9. Item 11--OCC2 height (OC2 HT) (DM). A 3-digit code is printed/downloaded for snags tallied at OCC 2. Update, if necessary, to insure that the OCC 2 height is never shorter than the OCC 3 height.

10. Item 12--OCC3 height (OC3 HT) (DM). Record a 3-digit code for all snags indicating the snag's height to the nearest decimeter. Snag height may be estimated or measured, and should reflect the snag's actual height (the distance from ground level to the present top of the snag). Do not reconstruct for missing parts. This item not needed for "gone" snags.

Snags frequently have broken, irregular tops. When measuring height on such trees, use the "25% rule" to determine the point on the bole to which height should be measured. Include in your height estimate portions of splintered tops (usually on decay class 1 or 2 trees) that have a diameter that is at least 25% of the diameter of the "entire bole" immediately below the broken portion (see figure below).



Unlike living trees, snags can shrink (not grow) in height over time! If the OCC 3 height is greater than the OCC 2 height, double check (i.e. measure) the snag's current height, and record the measurement. Change the OCC 2 height, so that it is not shorter than the OCC 3 height. These situations may be attributed to the fact that OCC 2 snag heights were often estimated.

11--Item 18--Growth Impactor (GI). Printed/downloaded as a 2-digit code for all snags tallied at OCC 2. The growth impactor code (called "damage/death" at OCC 2) indicated both decay class and use by wildlife as follows (do not change the printed/downloaded code):

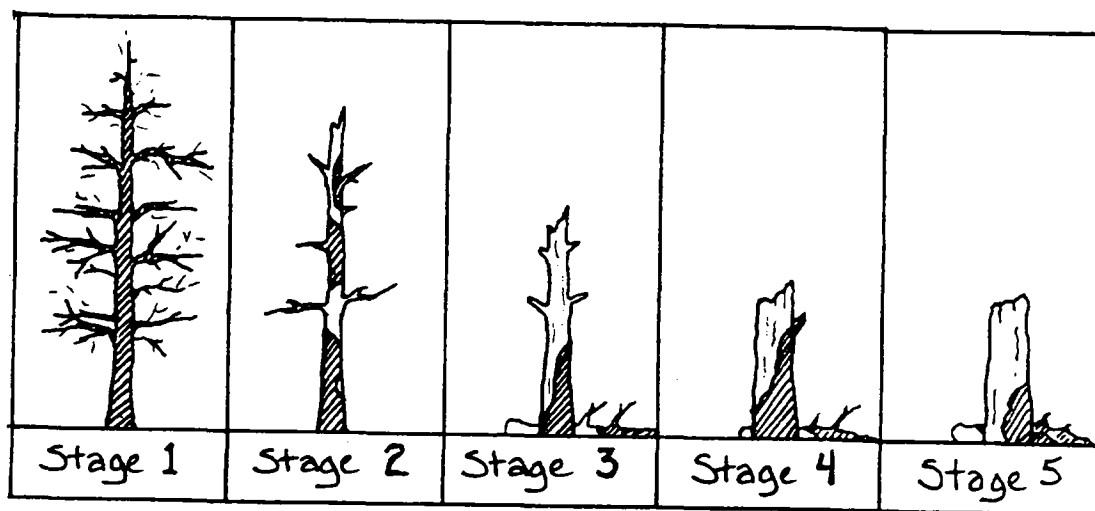
<u>OCC 2 damage/ death code</u>	<u>Broad decay class and use</u>
92	Hard snag with cavity or den.
93	Hard snag without apparent use.
94	Soft snag with cavity or den.
95	Soft snag without apparent use.

12. Item 19--Cause of Death/Use or Circumstance of disappearance(D/U). Record a 2-digit code for all snags. If a snag tallied at OCC 2 is present, this item indicates use by wildlife. Code "01" if a cavity or den is present, or "00" if there is no cavity or den. If a snag tallied at OCC 2 is now "gone", this item indicates the "circumstances of disappearance" of the snag. Codes and definitions are as follows:

Code OCC 3 Use or Circumstance of disappearance

00	TH 7; no cavity or den present.	<u>SNAG PRESENT</u>
01	TH 7; cavity or den present.	
02	TH 7; fell over "naturally" (wind, decay, etc.); still on ground.	
03	TH 7; fell over "naturally;" removed from site.	
04	TH 7; cut down and left on site.	<u>SNAG "GONE"</u>
05	TH 7; cut down and removed.	
06	TH 7; dbh and/or height no longer meet minimum for tally (snag "shrank" to less than 2 m tall and/or 22.5 cm dbh).	

14. Item 24--OCC 3 decay class (DC). Record a 1-digit code for all snags, indicating the snag's stage of decay. Use the figure (below) and table (next page) as guides.



Characteristics of Douglas-fir snags by decay class¹

Snag Characteristics

<u>Decay stage (code)</u>	<u>Limbs and branches</u>	<u>Top</u>	<u>% Bark Remaining</u>	<u>Sapwood presence</u>	<u>Sapwood condition</u>	<u>Heartwood condition</u>
1	All present	Pointed	100	Intact	Sound, incipient decay, hard, original color	Sound, hard, original color
2	Few limbs, no fine branches	Broken	Variable	Sloughing	Advanced decay, fibrous, firm to soft, light brown	Sound at base, incipient decay in outer edge of upper bole, hard, light to reddish brown
3	Limb stubs only	Broken	Variable	Sloughing	Fibrous, soft, light to reddish brown	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, reddish brown
4	Few or no stubs	Broken	Variable	Sloughing	Cubical, soft, reddish to dark brown	Advanced decay at base, sloughing from upper bole, fibrous to cubical, soft, dark reddish brown
5	None	Broken	Less than 20	Gone	Gone	Sloughing, cubical, soft, dark brown, <u>OR</u> fibrous, very soft, dark reddish brown, encased in hardened shell

¹ Characteristics are for Douglas-fir. Snags of other species may vary somewhat; use this table as a guide.

[this page intentionally blank--everyone knows why]

X. APPENDICES
TABLE OF CONTENTS

	PAGE
X. APPENDICES	132
Appendix 1--Field Crew Edit	133
Appendix 2-A--Sample landowner letter	134
Appendix 2-B--Sample release letter	135
Appendix 3--Checkplot procedures	136
Appendix 4--Slope correction table	142
Appendix 5--Limiting distance tables for 7M BAF prism	143
Appendix 6--Metric equivalents	144
Appendix 7--OCC2 codes for damage/cause of death & log deductions	145
Appendix 8--Tally guides and sample plot records	148

APPENDIX - 1

FIELD CREW EDIT

Thorough field data editing involves periodic review of the data during and between various collection procedures. The field crew is the primary focus in the edit process, which begins while measuring the plot.

1. Before leaving the point: At each sample point, make sure that all required items are completed and correctly updated. Items to check include, but are not limited to:

- a.) Two references per point
- b.) Tree number updated for OCC 2 trees that were given new numbers
- c.) OCC 2 dbh, azimuth, and distance updated if unacceptably different from the OCC 3 measurement.
- d.) Tree history changed for dead trees, and mortality trees entered again as snags (if they qualify)
- e.) Kind of "cull other" noted in remarks where coded
- f.) Point moved information completed if point was moved
- g.) Root disease, Hardwood site, and Nonstockable area mapped
- h.) Vegetation profile reviewed for completeness and correctness of codes

2. Before leaving the plot: Complete all required items on plot attribute record. (see plot and point attribute tally guide for required items)
Complete point mapping card where appropriate.

- a.) Check photos to see if properly labeled and pinpricked (POD,RP,PC). Make sure photo number is correct on plot attribute record.
- b.) Estimator, recorder and date is complete. Location description is more than adequate.
- c.) Present condition/past disturbance is complete with all necessary situations explained.
- d.) Plot diagram complete. Give reasons for substituted and moved points. Azimuth and distance between points completed. Indicate northerly direction.
- e.) All Field-Interactive Items completed.
- f.) Complete plot jacket label.

APPENDIX - 2-A

SAMPLE LANDOWNER LETTER
(forested plots)

The Pacific Northwest Research Station is inventorying the forests of western Washington to gain basic information used by researchers, planners, and the interested public. This information will help to answer questions concerning the amount, condition, and trends of Washington's forest resources. The inventory information is important to wise planning for the state's future.

The inventory data is collected every ten years from permanent inventory plots located on a 3.4 mile grid across western Washington. These inventory plots were last visited in 1978/79. County ownership records show that (number of plots) of these plots falls on or near your land. The approximate location(s) of this/these plot(s) is/are T , R , Sec. , .

We ask your permission to enter or cross your land to measure the vegetation on this/these plot(s). The data is we collect from the plot(s) on your land is combined with data from many other plots to provide information about forest resources for all of western Washington, and will not be identified in any way with your name or property. These data have no bearing on property or other taxes.

Our field staff will be in your area between May 15 and Sept. 30. If you wish, they will contact you before entering your land. If there is anyone we need to contact for access information such as locked gates, or if you have any other concerns, please contact us. A stamped card and a release are enclosed. The signed release statement relieves you of responsibility in the unlikely event our field people injure themselves while on your property.

If you have any questions, please contact Dan Oswald at 503-231-2117 for additional information. Thank you for your cooperation.

Sincerely,

CHARLES W. PHILPOT
Station Director

Enclosures

County Plot

APPENDIX - 2-B
SAMPLE RELEASE LETTER

R E L E A S E

The UNITED STATES FOREST SERVICE assumes liability for any damages caused by negligence of Forest Service personnel while entering upon or leaving (landowner name) property in connection with the reinventory of timber in the State of Washington, and (landowner) shall be held harmless for any liability cost or damage from injuries occurring to Forest Service personnel for any reason except the negligent or wrongful acts of (landowner name) while they are on the property owned or controlled by (landowner name).

CHARLES W. PHILPOT
Station Director
Pacific Northwest Research Station
US Department of Agriculture

APPENDIX - 3
CHECK PLOT PROCEDURES

TABLE OF CONTENTS

	PAGE
A. Objectives	134
B. Check plot policies	134
C. Check plot procedures	134
1. In the field	134
2. Completing the check plot form	134
Check plot form	135

APPENDIX - 3
CHECK PLOT PROCEDURES

A. Objectives. Check plots are performed for several purposes:

- (1) To measure the accuracy of collected data;
- (2) To ensure that procedures for field plot measurement are uniformly understood and consistently followed;
- (3) To inform data collectors of the required accuracy standards;
- (4) To provide incentive to do excellent work.

B. Check plot policies. The following policies for conducting check plots will be followed:

- (1) Each person will be checked within the first two weeks of field work.
- (2) Check plots will continue during the entire season.
- (3) Each person will be checked on remeasurement and/or walk-thru plots.
- (4) All check plot items count equally for each person who was on the plot.
- (5) At the end of the field season, awards will be made based on outstanding quality work and the total number of plots completed.

C. Check plot procedures.

1. In the field, the check cruiser checks all of the tree classifications/measurements, recording the data on a new tree tally sheet. The check cruiser or assistant (one of the crew members on the original plot) makes all of the tree measurements, directly comparing them to the data on original husky hardcopy. Items that are outside the accuracy limits are rechecked. Final decisions on accuracy rest with the check cruiser. Errors are circled in red on the original tally sheet, and the correct value written near the circle.

2. Completing the check plot form. Field plot items are organized into 14 categories on the check plot form. The percent correct in each of the categories is calculated by dividing the number of correct items by the total number of items.

Each category is rated as (1) outstanding, (2) acceptable, or (3) less than acceptable, based on the accuracy standards indicated on the form.

County _____ Plot # _____ Crew _____ Date _____

Checked by _____ Date _____

1. PLOT LOCATION

To receive Outstanding:

(A) If remeasurement, the plot must be relocated. (B) If new the plot must be within type and +/- 5m. (C) All items 100%

To receive Acceptable:

(A) If remeasurement, the plot must be relocated. (B) If new, the plot must be within type and +/- 10m. (C) All items 90%

	Score
a.) Remeasurement-relocated-----	_____
b.) New-within type-----	_____
c.) Occasion 1,2,and 3 pinpricks in same correct spot and labeled.---	_____
d.) Comments on spec sheet if incorrect pinprick requires new PI-----	_____
e.) RP tagged,pinpricked,labeled and described-----	_____
f.) RP azimuth +/- 4 degrees, distance-plot must be findable 10 yrs from now (judgement of checkers) and may +/- 5%-----	_____
Crew % and rating-----	_____

2. PLOT LAYOUT

To receive Outstanding:

(A) All points must be within land class and type. (B) All items 100%

To receive Acceptable:

(A) All points must be within land class and type. (B) All items 95%

	Score
a.) Points correctly numbered,dropped, or substituted -----	_____
b.) Plot diagrammed accurately.Az and distance between points correct	_____
c.) References tagged and recorded.Az +/- 4 degrees, distance +/- 20cm	_____
d.) If other than standard layout,reasons recorded-----	_____
Crew % and rating-----	_____

3. TRACKABLE TREE PRISM TALLY

To receive Outstanding all items 100%

To receive Acceptable all items 98%

	Score
a.) Prism tally-----	_____
Crew % and rating-----	_____

4. TRACKABLE TREE FIXED RADIUS TALLY

To receive Outstanding all items 100%

To receive Acceptable all items 98%

a.) Fixed radius tally----- Score
Crew% and rating-----

5. SITE TREE SELECTION (if needed)

To receive Outstanding all items 95%

To receive Acceptable all items 90%

a.) Site tree selection fits model for each tree----- Score
b.) Site tree height and age meet standards-----
Crew % and rating-----

6. TREE HISTORY AND SPECIES

To receive Outstanding all items 100%

To receive Acceptable all items 98%

a.) Tree history and species----- Score
Crew % and rating-----

7. HEIGHT AND DBH-TRACKABLE TREES

To receive outstanding all items 95%

To receive acceptable all items 88%

a.) Height normally formed up to 20m tall +/- 1m----- Score
b.) Height normally formed 21m + +/- 4%-----
c.) Dbh +/- 2cm per 50cm-----
Crew % and rating-----

8. STANDING DEAD TREE TALLY

To receive Outstanding all items 95%

To receive Acceptable all items 90%

a.) Snag tally----- Score
b.) Dbh +/- 10%-----
c.) Height +/- 10%-----
d.) Use or disappearance correct-----
e.) Decay class +/- 1 class-----
Crew % and rating-----

9. SAMPLE KIND AND LAND CLASS

To receive Outstanding or Acceptable all items 100%

Score

- a.) Sample kind-----
b.) Land class-----
Crew % and rating-----

10. TREE IDENTIFICATION AND CLASSIFICATION

To receive Outstanding all items 95% To be Acceptable all items 90%

Score

- a.) Height estimates in trees with missing parts +/- 2m-----
b.) Dbh nail height +/- 3cm, 2 or more nails in 75cm + trees-----
c.) Age-bored +/- 2 yr, estimated +/- 10%-----
d.) Crown ratio +/- 1 class-----
e.) Crown class - free to grow or not-----
f.) Growth impactor or death cause recognized, root rot correct-----
g.) Form class first 2.5 meter log straight or not-----
h.) Mistletoe recognized +/- 2 classes-----
j.) Cull other recognized +/- 10%-----
k.) Cull rot recognized-indicator correct-----
l.) Comment on unreasonable change-----
Crew % and rating-----

11. POINT CLASSIFICATION

To receive Outstanding all items 95% To be Acceptable all items 90%

Score

- a.) Nonstockable, root rot-recognized +/- 15%-----
b.) Vegetation percent cover +/- 15%-----
c.) Vegetation correct identification and code and layer-----
d.) Change identified +/- 15%-----
Crew % and rating-----

12. PLOT AREA CLASSIFICATION

To receive Outstanding all items 95% To be Acceptable all items 90%

Score

- a.) Stream proximity +/- 5 meter, stream class correct-----
b.) Aspect +/- 1 class-----
c.) Slope +/- 15%-----
d.) Harvest kind and cultural activity recognized, date +/- 25%-----
e.) Hardwood site-----
f.) Plot description-questions on land class, productivity, treatment,
disease, layout, harvest, etc addressed-----
g.) Plant community in correct cubic class-----
Crew % and rating-----

13. OTHER ITEMS NOT PREVIOUSLY COVERED (if needed-inspectors decision)

Outstanding-100%, Acceptable-95%

Score

- a.)-----
Crew % and rating-----

14. STOCKING PLOTS _____

OUTSTANDING ITEMS

ACCEPTABLE ITEMS

UNACCEPTABLE ITEMS

County

Plot #

Crew

Date

Checked by

Date

APPENDIX - 4
SLOPE CORRECTION TABLE

PERCENT	EXPANSION FACTOR	EXPANSION FACTOR RECIPROCAL	SLOPE DIST. FOR 20 m	SLOPE DIST. FOR 25 m	SLOPE DIST. FOR 30 m
10	1.005	1.00	20.1	25.1	30.2
15	1.010	.99	20.2	25.3	30.3
20	1.020	.98	20.4	25.5	30.6
25	1.031	.97	20.6	25.8	30.9
30	1.044	.96	20.9	26.1	31.3
35	1.060	.94	21.2	26.5	31.8
40	1.077	.93	21.5	27.0	32.3
45	1.097	.91	21.9	27.4	32.9
50	1.118	.89	22.4	28.0	33.5
55	1.141	.88	22.8	28.5	34.2
60	1.166	.86	23.3	29.2	35.0
65	1.194	.84	23.9	29.9	35.8
70	1.221	.82	24.4	30.0	36.6
75	1.250	.80	25.0	31.3	37.5
80	1.281	.78	25.6	32.0	38.4
85	1.312	.76	26.2	32.8	39.4
90	1.345	.74	26.9	33.6	40.4
95	1.379	.72	27.6	34.5	41.4
100	1.414	.70	28.3	35.4	42.4
105	1.450	.69	29.0	36.3	43.5
110	1.486	.67	29.7	37.2	44.6
115	1.524	.66	30.5	38.1	45.7
120	1.562	.64	31.2	39.1	46.9
125	1.601	.62	32.0	30.0	48.0
130	1.640	.61	32.8	41.0	49.2
135	1.680	.60	33.6	42.0	50.4
140	1.720	.58	34.4	43.0	51.6
145	1.761	.57	35.2	44.0	52.8
150	1.803	.55	36.1	45.1	54.1

APPENDIX - 5
POINT SAMPLING HORIZONTAL LIMITING DISTANCES (METRIC)
7M BAF PRISM (F = 0.1889)

DBH cm	Dist.m	DBH cm	Dist.m
0.1	.02	41	7.74
.2	.04	42	7.93
.3	.06	43	8.12
.4	.08	44	8.31
.5	.10	45	8.50
.6	.11	46	8.69
.7	.13	47	8.88
.8	.15	48	9.07
.9	.17	49	9.26
1	.19	50	9.45
2	.38	51	9.63
3	.57	52	9.82
4	.76	53	10.01
5	.94	54	10.20
6	1.13	55	10.39
7	1.32	56	10.58
8	1.51	57	10.77
9	1.70	58	10.96
10	1.89	59	11.15
11	2.08	60	11.33
12	2.27	61	11.52
13	2.46	62	11.71
14	2.64	63	11.90
15	2.83	64	12.09
16	3.02	65	12.28
17	3.21	66	12.47
18	3.40	67	12.66
19	3.59	68	12.85
20	3.78	69	13.03
21	4.97 3.97	70	13.22
22	4.16	71	13.41
23	4.34	72	13.60
24	4.53	73	13.79
25	4.72	74	13.98
26	4.91	75	14.17
27	5.10	76	14.36
28	5.29	77	14.55
29	5.48	78	14.73
30	5.67	79	14.92
31	5.86	80	15.11
32	6.04	81	15.30
33	6.23	82	15.49
34	6.42	83	15.68
35	6.61	84	15.87
36	6.80	85	16.06
37	7.99 6.99	86	16.25
38	7.18	87	16.43
39	7.37	88	16.62
40	7.56	89	16.81
		90	17.00

APPENDIX - 6
METRIC EQUIVALENTS

Length

1 inch = 2.54 centimeters (cm)
1 foot = 0.3048 meter (m)
1 mile = 1.609 kilometers (km)

Area

1 acre = 0.4 hectare (ha) (approximately)
5 acres = 2 hectares (ha) "
1,000 acres = 404.7 hectares (ha) (exactly)
1 hectare = 2.471 acres "

Volume

1,000 cubic feet = 28.3 cubic meters (m^3)
1 cubic foot per acre = 0.07 cubic meter per hectare (m^3/ha)

APPENDIX - 7
OCC 2 CODES FOR DAMAGE/CAUSE OF DEATH AND LOG DEDUCTION

(1) Damage/cause of death.

Cause of death--(recorded for dead trees)

<u>Code</u>	<u>Cause of death</u>	<u>Code</u>	<u>Cause of death</u>
10	insects	92	Hard snag w/cavities or dens
20	disease	93	Hard snag w/o apparent use
30	fire	94	Soft snag w/cavities or dens
40	animal	95	Soft snag w/o apparent use
50	weather	96	Down salvable dead tree with
60	suppression		> 40 cu. ft. gross volume
70	unknown		
80	indirectly killed by logging		
90	killed outright in logging		

Damage codes--(recorded for live trees)

<u>Code</u>	<u>Damage</u>
00	no serious damaging agent
11	bark beetles
12	defoliators
13	balsam woolly aphid
14	Sitka spruce weevil
21	white pine blister rust
22	other rust cankers on main bole
23	conks on bole, limb, or ground near tree
27	other diseases and rot
29	Phellinus weirii
30	fire damage
40	animal damage
51	lightening
52	wind
52	other weather
69	suppressed sapling
71	natural mechanical injury
72	top out, dead, or spike top
73	forked top or multiple stem
74	deformed top above merchantable height in under-rotation-age tree
75	needles or leaves noticeably short, and/or sparse or off-color
77	excessive lean (over 15 degrees from vertical)
78	excessive forking (a hardwood that forks within the first 8 feet or a conifer that forks within the first 12 feet, the main fork of which forks again within 8 or 12 feet, respectively)
81	damage by power equipment
82	other logging damage
83	damage by cutting
84	damage by chemicals
91	excessive taper or deformity--will not produce a 12-foot conifer or 8-foot hardwood log

(2) Log deduction code. 5-digit code:

1st and 2nd digits = number of log affected.

3rd digit = cull indicator. If two or more cull indicators were present in a log, each was coded unless one canceled out the other (e.g. sweep would not have been coded if the log was a cull due to rot).

4th and 5th digits = amount of cull in the log, in terms of linear feet, fraction or percent of log, or percent of total tree volume, as called for by the specific indicator.

Cull
indicator
code

(3rd digit)

Type of cull

Code for amount of cull

(4th and 5th digits)

1	top out	01 through 16, indicating the length of log missing in feet. When culling for broken top, cull 4 feet below break for splintering; cull more if there is indication that splintering goes beyond 4 feet.
2	fork within merchantable length of bole	01 through 16, indicating length of log missing due to forking of the main bole.
3	crook (buck-out loss)	01 through 16, indicating length of log bucked out.
4	sweep	codes are in terms of percent of log
5	decay based on indicators such as scars, seams, cracks, and other mechanical bole wounds, visibly rotten wood, and all conks except <u>Polyporus amarus</u> (pecky cedar rot) and <u>Fomes officinalis</u> (quinine conk rot)	01 through 16 indicating length of log in feet or number of panels affected (for 8-foot log the maximum code is 08; for 16-foot logs the maximum code is 16).
6	<u>Polyporus amarus</u> conk or shot hole cup on incense-cedar	One conk or shot hole cup indicates the entire tree is cull. Indicate the log in which the indicator is found and code 4th and 5th digit as 99.
7	<u>Fomes officinalis</u> (quinine conk)	One or more indicators means 50 percent of tree is cull. Code by log position and show cull as 50.

8	sapwood rot in dead trees, or scaling diameter reduction of logs due to flutes, flanges, and other depressions and numerous small crooks	For dead trees code for one log only. Computer will interpret as percent of tree volume lost. For live trees code by log affected. Computer will interpret as percent of log volume lost.
---	---	--

9 Western red cedar decay Indicators

- 01 No indicators
- 06 dead or broken top
- 07 forking - presence of
- 08 lyre top
- 09 rotten seam - ground contact
- 10 rotten seam - no ground contact; below 10 m
- 11 rotten seam - no ground contact; 10 + m
- 12 seam - ground contact
- 13 seam - no ground contact; below 10 m
- 14 seam - no ground contact; 10 + m
- 15 Phellinus infection
- 16 conks
- 17 sucker limbs - bottom 1/3
- 18 sucker limbs - mid 1/3
- 19 sucker limbs - top 1/3
- 20 1 - 25% cull (cruiser's estimate)
- 21 26 - 50% cull (cruiser's estimate)
- 22 51 - 75% cull (cruiser's estimate)
- 23 76 + cull (cruiser's estimate)

APPENDIX - 8
TALLY GUIDES AND SAMPLE PLOT RECORDS

TABLE OF CONTENTS

	PAGE
A. What kind of plot layout should you use?	180
B. Kinds of plot tally and tally locations	180
C. Tally requirements by sample kind and OCC 3 GLC	181
D. Sample plot attribute record.	183
E. Sample point attribute record	184
F. Tree tally guides	
1. Sample kind 1 & 2 plots.	185
2. Sample kind 1-7 plots	186
3. Sample kind 7 plots.	188

APPENDIX - 8
TALLY GUIDES AND SAMPLE PLOT RECORDS

KINDS OF PLOT TALLY AND TALLY LOCATIONS

<u>Tally kind</u>	<u>Tally location</u>	<u>See page:</u>
Plot area ident. and classification	Plot attribute record	18
Reference trees	Trackable tree tally record	36
Site trees ¹	Plot attribute record	62
Point attributes	Point attribute record	66
Root disease	Point mapping record and point attribute record	73
Vegetation profile	Point attribute record	78
Trackable trees	Trackable tree tally record	85
Stocking tree	Stocking tree tally record	118
Snags	Trackable tree tally record	124

¹Refer to Interactive Items on plot attribute record

TALLY REQUIREMENTS BY SAMPLE KIND

<u>Sample kind</u>	<u>OCC 3 GLC</u>	<u>Plot attr. record</u>	<u>Point attr. record</u>	<u>Point mapping record</u>	<u>Tree tally needed</u> <u>On these kinds of points:</u> ¹	
1-4,7	20	1-10 11-13, 15-27	I-IV,	YES ²	-Reference trees -Site trees ² -3.3-m fixed-radius plot -7M BAF prism & 17 m fixed-radius--trackable trees & standing dead -stocking trees (SK 1,3)	N/R,N N/R,N or in plot area N/R,N N/R,N N/R,N,S
5,6	20	1-5,7,9 10 11-13 15-27	I-IV,	YES	-Reference trees -Site trees -3.3-m fixed-radius plot -7M BAF prism & 17 m fixed-radius--trackable trees & standing dead -stocking trees (SK 5)	N N or in plot area N N N,S
8	41,44, 46	1-14 ³	I,III, IV	NO	-Reference trees	N
9	61-69, 92	1-9 ³	--	NO	--	--

¹N/R = new/remasured point; N = new or reconstructed point; S = stocking point

²Refer to Interactive Items on plot attribute record.

³OCC2 data items not required if plot is new-to-inventory.

WESTERN WASHINGTON FOREST INVENTORY PLOT ATTACHMENT RECORD

COUNTY XXXXXXXXXXXX (XXX) PLOT(XXX) MAP# XXXXXX PNT# XXX PHOTO# XXXXXX-XXX

AREA IDENTIFICATION

1	COUNTY	XXX
2	PLOT NUMBER	XXX
3	SAMPLE KIND	X
4	OWNER CLASS	XXX
5	OCC3 INV DATE	....
6	OCC2 INV DATE	XXXX
7	OCC3 GND LAND CLASS	..
8	OCC2 GND LAND CLASS	XX
9	FOR LAND STRATUM	XX
10	PI DIRECTION	XX

AREA CLASSIFICATION

11	PRECIPITATION (CM)	XXX
12	ELEVATION (DK)	XXXX
13	PLANT ASSOC'N	XXXXXX
14	STAND CONDITION	.
15	ASPECT	..
16	SLOPE	..
17	TYPE OF LOGGING	..
18	SOIL DEPTH	X
19	HVST KIND SINCE OCC2	.
20	HVST KIND BEFORE OCC2	X
21	HVST DATE SINCE OCC2	..
22	HVST DATE BEFORE OCC2	XX
23	SIL.TREAT.SINCE OCC2	..
24	OCC2 TOP	XXXX
25	HDWD SITE	.
26	# NR POINTS	.
27	# N POINTS	.

SITE INDEX DATA:

#	Eq	Sp	Dbh	Ht	RHt	Age	SI
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX

#	Eq	Sp	Dbh	Ht	RHt	Age	SI
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX
XX	X	XXX	XXXX	XXX	...	XXX	XXX

COUNTY	PLOT	DATE
--------	------	------

ESTIMATOR(S) _____ RECORDER _____

RP: SPECIES DBH cm AZ SLOPE DISTANCE M

[illegible]

LOCATION DESCRIPTION _____

PRESENT CONDITION/PAST DISTURBANCE

[illegible]

PNT LOCATION: MOVED:
Pt-Pt Az Dst-dm Az Dst-dm

INTERACTIVE ITEMS: (O = Office, F = Field)

0 - FIELD CHECK ITEM: _____

0 - OWNER RESPONSE: YES (Card enclosed) NO (Need to check owner list)

F - CONTACT OFFICE ABOUT _____

F - OCC2 GLC UPDATED? (If YES, explain above)

F - OWNER UPDATED? (If YES, explain above)

F - PINPRICK CORRECT? _____ If NO, corrected by: _____ Does PNT need RE-PI? _____

COUNTY .. PLOT ...

I.	POINT NUMBER	.1	.2	.3	.4	.5	IV. HEIGHTS OF CANOPY LAYERS
	ASPECT	..	..	..	..	..	<u>LAYER</u> <u>HGT(dm)</u>
	SLOPE	..	..	..	..	..	TREES 1 ...
	STREAM CLASS	.	.	.	.	.	2 ...
	STREAM PROXIMITY	..	..	..	..	..	3 ...

II.				(17 m RADIUS)
		%	%	%
NONSTOCKABLE AREA	..	..	..	..
HARDWOOD SITE	..	..	..	..
ROOT <u>DISEASE-</u>	..	..	..	..

SHRUBS	1	...
	2	...
HERBS	1	...
	2	...

[illegible][illegible][illegible][illegible]

TALLY GUIDE FOR N/R POINTS ON SAMPLE KIND 1 and 2
FULL REMEASUREMENT PLOT

LINE#	PT	TH	SPP	AZM	DIST	TRN	OC2 DBH	OC3 DBH	OC2 HGT	OC3 HGT	BH AGE	C/R	C/C	GI	D/ U/M	CL	CO	CR	DC			
1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
XXXXX	NR	1	XXX	XXX	XXXX	XXX	XXXX	XXXX	XXX	PPF	XXX	X	X	X	X	XX	--	C	M	XX	X	-
XXXXX	NR	1	XXX	XXX	----	----	XXXX	XXXX	XXX	XXX	XXX	X	X	X	X	XX	--	C	M	--	-	-
XXXXX	NR	2	XXX	XXX	XXXX	XXX	----	XXXX	----	XXX	XXX	-	X	-	X	XX	--	C	M	XX	X	-
XXXXX	NR	3	XXX	XXX	XXXX	XXX	XXXX	----	XXX	----	XXX	X	-	X	-	XX	--	C	M	XX	X	-
XXXXX	NR	3	XXX	XXX	----	----	XXXX	----	XXX	----	XXX	X	-	X	-	XX	--	C	M	--	-	-
XXXXX	NR	4	XXX	XXX	XXXX	XXX	----	XXXX	----	XXX	XXX	-	X	-	X	XX	--	C	M	XX	X	-
XXXXX	NR	4	XXX	XXX	----	----	----	XXXX	----	XXX	XXX	-	X	-	X	XX	--	C	M	--	-	-
XXXXX	NR	5	XXX	XXX	XXXX	XXX	XXXX	----	XXX	----	XXX	X	-	X	-	XX	XX	C	M	XX	X	-
XXXXX	NR	5	XXX	XXX	----	----	XXXX	----	XXX	----	XXX	X	-	X	-	XX	XX	C	M	--	-	-
XXXXX	NR	6	XXX	XXX	XXXX	XXX	XXXX	XXXX	----	XXX	XXX	X	X	X	X	XX	--	C	M	XX	X	-
XXXXX	NR	6	XXX	XXX	----	----	XXXX	XXXX	----	XXX	XXX	X	X	X	X	XX	--	C	M	-	-	-
XXXXX	NR	7	XXX	XXX	XXXX	----	XXXX	XXXX	XXX	XXX	----	-	-	-	-	XX	XX	-	-	--	-	X
XXXXX	NR	7	XXX	----	----	----	XXXX	----	XXX	----	----	-	-	-	-	XX	XX	-	-	--	-	-
XXXXX	NR	7	XXX	XXX	XXXX	----	----	XXXX	----	XXX	----	-	-	-	-	XX	-	-	--	-	-	X
XXXXX	NR	8	XXX	XXX	XXXX	XXX	XXXX	----	XXX	----	XXX	X	-	X	-	XX	--	C	M	XX	X	-
XXXXX	NR	9	XXX	XXX	XXXX	----	----	XXXX	----	----	----	-	-	-	-	----	----	-	-	--	-	-
XXXXX	NR	0	----	----	----	----	----	----	----	----	----	-	-	-	-	----	----	-	-	--	-	-

REMARKS:

Live tree ≥ 12.5 cm dbh at OCC2 & 3; or < 12.5 cm dbh at OCC2, ≥ 12.5 cm dbh at OCC3, in NE Quadrant.

Tallied < 12.5 cm dbh at OCC2, live at OCC2 & OCC3, < 12.5 cm dbh at OCC3. NE Quadrant only

Live tree on N/R point, not tallied at OCC2, not in NE quadrant, ≥ 12.5 cm dbh at OCC3.

Live ≥ 12.5 cm dbh at OCC2. Culturally killed OCC3.

Live < 12.5 cm dbh at OCC2. Culturally killed OCC3. NE Quadrant only.

Not present or not tallied at OCC2. < 2.5 cm dbh at OCC2. ≥ 12.5 cm dbh at OCC3. NE quadrant only.

Not tallied at OCC2, < 2.5 cm dbh at OCC2. < 2.5 - 12.4 cm dbh live at OCC3. NE Quadrant only.

Live ≥ 12.5 at OCC2. Dead at OCC3.

Live < 12.5 at OCC2. Dead at OCC3. NE Quadrant only.

≥ 12.5 cm dbh at OCC3 - Missed at OCC2.

< 12.5 cm dbh at OCC3 - Missed at OCC2. NE Quadrant only.

Snag at OCC2 and OCC3.

Snag at OCC2 - Gone at OCC3.

New snag. Live tally at OCC2 - Now snag or live nontally at OCC2 - Now snag.

Stump of live tally tree ≥ 12.5 cm dbh at OCC2.

Reference only tree.

Point with no live tally at OCC2 or OCC3.

X - Item must be completed
F - First measured height of that species on the plot
C - Conifers only
M - Maples only

TALLY GUIDE FOR N/R POINTS ON SAMPLE KIND 1 and 2
FULL REMEASUREMENT PLOT

LINE#	PT	TH	SPP	AZM	DIST	TRN	OC2 DBH	OC3 DBH	OC2 HGT	OC3 HGT	BH AGE	C/R	C/C	GI	D/ U	M	CL	CO	CR	DC		
1	2	3	4	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
XXXXX	NR	1	XXX	XXX	XXXX	XXX	XXXX	XXXX	XXX	PPP	XXX	X	X	X	X	XX	--	C	M	XX	X	-
XXXXX	NR	1	XXX	XXX	----	---	XXXX	XXXX	XXX	XXX	XXX	X	X	X	X	XX	--	C	M	--	-	-
XXXXX	NR	2	XXX	XXX	XXXX	XXX	----	XXXX	---	XXX	XXX	-	X	-	X	XX	--	C	M	XX	X	-
XXXXX	NR	3	XXX	XXX	XXXX	XXX	XXXX	----	XXX	---	XXX	X	-	X	-	XX	--	C	M	XX	X	-
XXXXX	NR	3	XXX	XXX	----	---	XXXX	----	XXX	---	XXX	X	-	X	-	XX	--	C	M	--	-	-
XXXXX	NR	4	XXX	XXX	XXXX	XXX	----	XXXX	---	XXX	XXX	-	X	-	X	XX	--	C	M	XX	X	-
XXXXX	NR	4	XXX	XXX	----	---	----	XXXX	---	XXX	XXX	-	X	-	X	XX	--	C	M	--	-	-
XXXXX	NR	5	XXX	XXX	XXXX	XXX	XXXX	----	XXX	---	XXX	X	-	X	-	XX	XX	C	M	XX	X	-
XXXXX	NR	5	XXX	XXX	----	---	XXXX	----	XXX	---	XXX	X	-	X	-	XX	XX	C	M	--	-	-
XXXXX	NR	6	XXX	XXX	XXXX	XXX	XXXX	XXXX	---	XXX	XXX	X	X	X	X	XX	--	C	M	XX	X	-
XXXXX	NR	6	XXX	XXX	----	---	XXXX	XXXX	---	XXX	XXX	X	X	X	X	XX	--	C	M	-	-	-
XXXXX	NR	7	XXX	XXX	XXXX	---	XXXX	XXXX	XXX	XXX	---	-	-	-	-	XX	XX	-	-	--	-	X
XXXXX	NR	7	XXX	---	----	---	XXXX	----	XXX	---	---	-	-	-	-	XX	XX	-	-	--	-	-
XXXXX	NR	7	XXX	XXX	XXXX	---	----	XXXX	---	XXX	---	-	-	-	-	XX	-	-	-	--	-	X
XXXXX	NR	8	XXX	XXX	XXXX	XXX	XXXX	----	XXX	---	XXX	X	-	X	-	XX	--	C	M	XX	X	-
XXXXX	NR	9	XXX	XXX	XXXX	---	----	XXXX	---	---	---	-	-	-	-	---	---	-	-	--	-	-
XXXXX	NR	0	---	---	----	---	----	----	---	---	---	-	-	-	-	---	---	-	-	--	-	-

REMARKS:

Live tree >12.5 cm dbh at OCC2 & 3; or <12.5 cm dbh at OCC2, >12.5 cm dbh at OCC3, in NE Quadrant.

Tallied <12.5 cm dbh at OCC2, live at OCC2 & OCC3, <12.5 cm dbh at OCC3. NE Quadrant only

Live tree on N/R point, not tallied at OCC2, not in NE quadrant, >12.5 cm dbh at OCC3.

Live >12.5 cm dbh at OCC2. Culturally killed OCC3.

Live <12.5 cm dbh at OCC2. Culturally killed OCC3. NE Quadrant only.

Not present or not tallied at OCC2. <2.5 cm dbh at OCC2. >12.5 cm dbh at OCC3. NE quadrant only.

Not tallied at OCC2, <2.5 cm dbh at OCC2. <2.5-12.4 cm dbh live at OCC3. NE Quadrant only.

Live >12.5 at OCC2. Dead at OCC3.

Live <12.5 at OCC2. Dead at OCC3. NE Quadrant only.

>12.5 cm dbh at OCC3 - Missed at OCC2.

<12.5 cm dbh at OCC3 - Missed at OCC2. NE Quadrant only.

Snag at OCC2 and OCC3.

Snag at OCC2 - Gone at OCC3.

New snag. Live tally at OCC2 - Now snag or live nontally at OCC2 - Now snag.

Stump of live tally tree >12.5 cm dbh at OCC2.

Reference only tree.

Point with no live tally at OCC2 or OCC3.

X - Item must be completed
F - First measured height of that species on the plot
C - Conifers only
M - Maples only

POINT MAPPING RECORD

COUNTY _____ PLOT _____

DATE _____

CREW _____

DISEASE CODES

PW = Phellinus (Laminated)

BS = Black stain

AM = Armillaria

FA = Pomes annosus

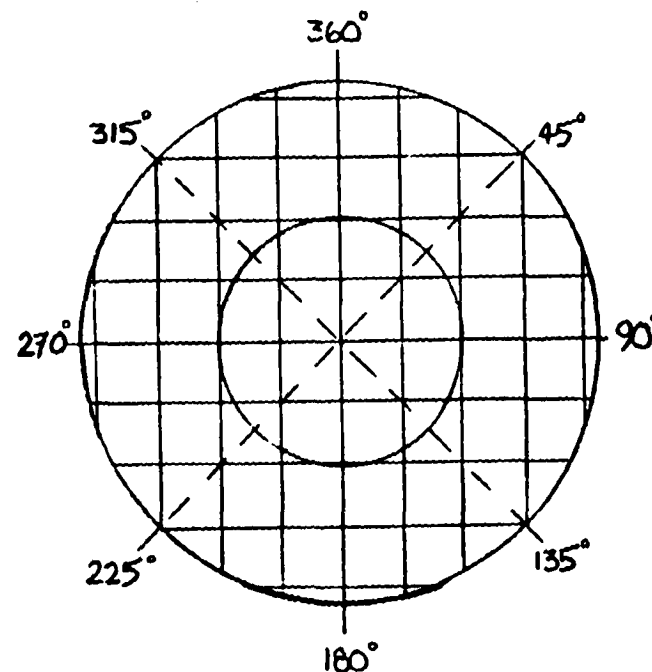
UK = Unknown

NO = None Present

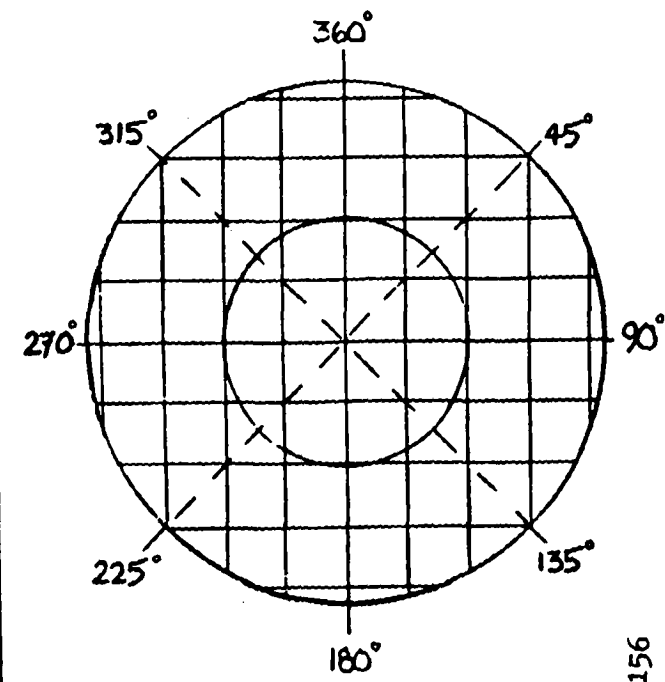


Grid interval = 4 meters

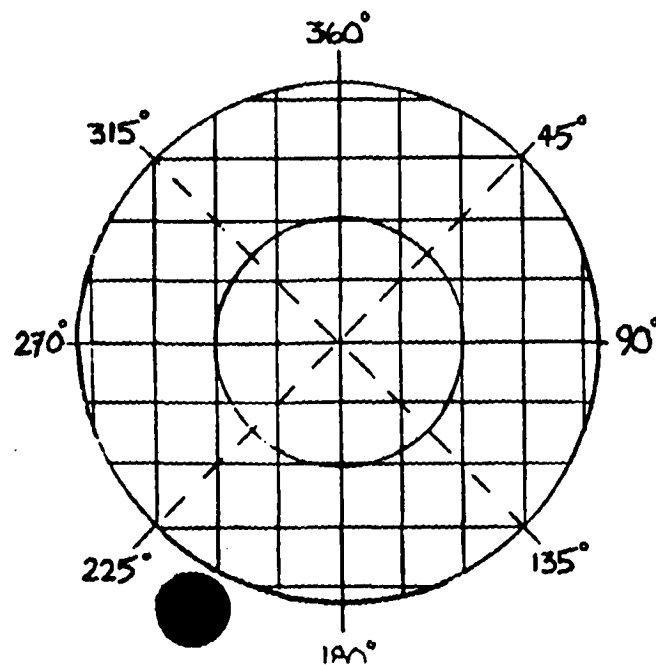
POINT # _____ DISEASE _____



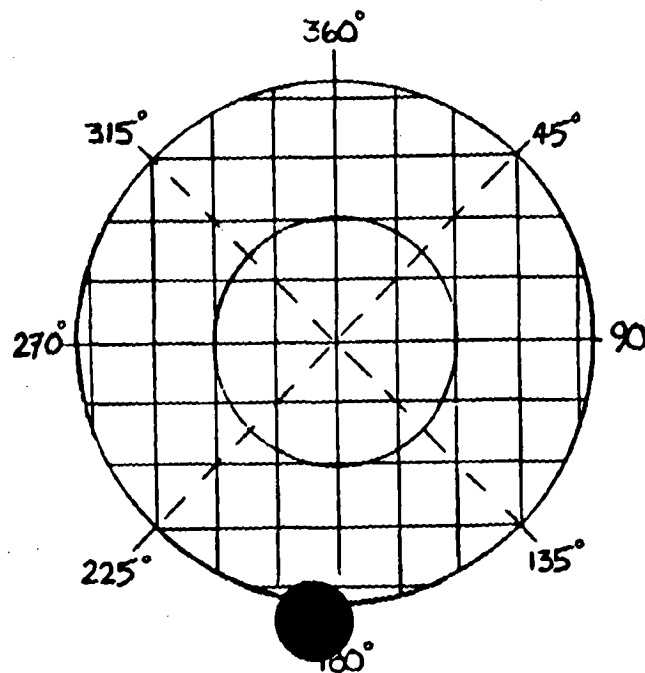
POINT # _____ DISEASE _____



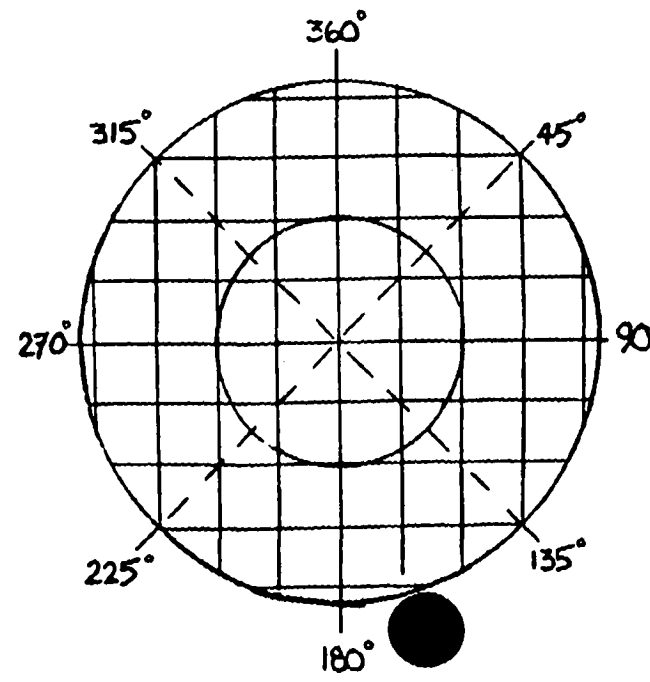
POINT # _____ DISEASE _____



POINT # _____ DISEASE _____



POINT # _____ DISEASE _____



INDEX

- active logging 16
- additional sources of
 - documentation 9
- age
 - breast-high 104
 - extrapolated for large trees 104
 - site trees 63,64
 - stand, estimation of 55
 - stocking trees 122
 - trackable trees 104
- amputation 30
- Annosus 73,77,108,109
- Armillaria 73,77,108,109
- aspect
 - plot average 53
 - point 67
- association, plant 49
- attribute record
 - plot 18,47
 - point 66
 - sample plot 151
 - sample point 153
- azimuth
 - using baseline 16
 - reference trees 36
 - RP 34
 - snags 128
 - trackable trees 95
- B
- backdating dbh 96,97
- balsam woolly aphid 109,111
- bark beetles 1108,109,111
- baseline 16
- bent tree 103
- blackstain root disease 108,109
- borer, increment 96
- breast height 98,99
- breast-high age
 - extrapolated for large trees 104
 - site trees 64
 - stocking trees 122
 - trackable trees 104
- broad forest type
 - (stand condition) 38
- C
- canopy closure 80
- canopy layers 81
- causal fungus 73
- cause of death,
 - snags 128
 - trackable trees 112
- check plot
 - objectives 137
 - policies 137
 - procedures 137
 - sample form 138
- check list of items 12,13
- class of stream 67
- clean and release,
 - definition 56
- clearcut harvest, definition 54
- clearcut, regenerating 54
- climax overstory species 53
- clump, bigleaf maple 113
- constructed road 26,27
- contact office about 59
- county codes 19
- crew identification & date 59
- crew identification & date 59
- clean and release,
 - definition 56
- clearcut harvest, definition 54
- climax overstory species 53
- constructed road 26,27
- Contact Office About 59
- county codes 19
- crew identification and date 59
- crown class
 - codes 106
 - OCC3 106
 - OCC2 106
- crown overlap 81
- crown ratio
 - codes 106
 - OCC3 106
 - OCC2 106
- cull indicators
 - cull rot category 116
 - OCC2 log deduction codes 146,147
 - cull rot indicators 116
- cull other,
 - trackable trees 114
 - cultural nonforest
 - stringers 29,30
- culturally killed, tree history
 - defined 93
- cutbanks 27
- D
- damage
 - damage/cause of death
 - codes, OCC2 146
 - snags 128

damage
 growth impactors 108-110
 date of harvest
 before OCC2 55
 since OCC2 55
 date of OCC3 inventory 24
 date of OCC2 inventory 24
 dbh
 reference trees 36
 RP
 snags 126
 site trees 64
 stocking trees 122
 trackable trees
 backdating (reconstruction) 96
 calculating OCC 2 from
 measured increment 96
 marking 97
 measuring 98
 OCC3 97
 OCC2 96
 recording 97
 special circumstances 99
 dead tree (snag) tally 124
 death, cause of,
 snags 128
 trackable trees 112
 decay class,
 snags 129,130
 declination 19
 defoliators 108-111
 deformed trees, heights of 102
 diagram, plot layout 39,152
 disease assessment, root 73
 disease codes 173
 distance
 reference trees 36
 RP 34
 snags 126
 trackable trees 86
 distinct forest boundary 29
 Douglas-fir/western hemlock
 site selection method 62
 downloading,
 DG-1 to Husky ???
 Husky to DG-1 ???
 dwarf mistletoe 112
 E
 edit
 computer 133
 field coordinator 133
 field crew 133
 elevation 48
 equipment checklist 12,13
 excessively deformed sapling 110
 extrapolated age 105
 F
 felled and bucked plot 16
 field coordinator 16,22
 fire (growth impactor) 108
 five point plots
 new 21,37,48,88
 reconstructed 21,37,48,88
 remeasurement 21,37,48,88
 fixed-radius plot
 3.3-meter, stocking trees 120
 3.3-meter, trackable trees 86
 17-meter, hardwood site
 17-meter, nonstockable area 69
 17-meter, root disease 73
 17-meter, snags 125
 17-meter, trackable trees 89
 17-meter, vegetation profile 78
Fomes annosus 73,77
 forest boundary 28
 forestland 31
 forest land stratum 25
 G
 GLC
 amputation 30
 codes 24
 definitions and
 classification rules 26,31
 ground land class
 amputation 30
 codes 24
 definitions and
 classification rules 26,31
 identifying boundaries 28
 growth impactors,
 trackable trees 108
 H
 hardcopy,
 edit 133
 Husky ???
 making ???
 hardwood site
 classification 58
 plant association 50
 mapping 75
 17-m fixed radius plot ???
 harvest date of,
 before OCC2 55
 since OCC2 55
 harvest kind of,
 before OCC2 55
 since OCC2 54

- harvested tree, tree history
 - defined 93
- healthy-appearing tree 74
- height
 - canopy layers 81,82
 - herbs 83
 - shrubs 83
 - snags 127
 - stocking points 122
 - trackable trees
 - deformed 102
 - guidelines for measuring 102
 - leaning trees 103
 - normally-formed 102
 - OCC3 102
 - OCC2 102
 - tree layers 83
- herbs
 - heights of layers 83
 - percent cover of all 81
- I
- improvement cut, definition 56
- increment
 - borer 96
 - OCC2 96
 - calculating OCC2 dbh
 - by measuring 96
 - identifying suppression in
 - site trees 62
 - calculating OCC3 dbh of
 - grown-together trees 101
 - determining breast-high age
 - of large trees 104,105
- indefinite forest boundary 28
- infection center,
 - root disease 74
- inhibiting vegetation,
 - stocking points 123
- insect damage, guide for
 - identifying 111
- interactive items 59
- introduction 8
- inventory of western Washington
 - objectives 8
 - sample design 9
- inventory unit, determine if
 - plot is in 19
- isolated vegetation 29
- K
- killing of vegetation,
 - definition (clean and release) 56
- kind of harvest
 - before OCC2 55
 - since OCC2 55

- kinds of plot tally and
 - tally locations 149
- King's site tree method 62
- L
- laminated root rot 73,76
- land class 31
- land class amputation 30
- land owner
 - large tracts 13
 - small tracts 13
 - contact (interactive items) 61
 - response/action needed card 61
 - sample letter 134
 - sample release letter 135
- layer, canopy (vegetation profile)
 - heights of herbs 83
 - heights of shrub layers 83
 - heights of tree layers 88
- leaning trees 103
- letters, landowner 134,135
- limiting distance factors
 - 7M BAF 90,143
- limiting distance table
 - 7M BAF 143
- line number,
 - stocking trees 122
 - trackable trees 91
- locating the plot
 - aids 14
 - inspection, by 15
 - on the ground 14
 - RP and baseline 16
- location description 33
- log deduction codes, OCC2 145
- logging,
 - plots with active 16
 - type of 53
- lost plot (reconstructed) 37,38,86-102
 - points 41
- M
- maintained structures 28
- management, intent 31
- marking
 - dbh 96
 - point center 36,86
 - reference trees 36
 - point 1 reference trees 35
 - RP 34
- merchantability standards 114
- metric equivalents 144
- minimum area rules
 - ground land class 26
 - stand condition 38,52

- minimum length and width
 - of stringers 26
- minimum log 114
- mistletoe, dwarf 112
- monumenting information, tree 95
- mortality,
 - tree history, defined 93
- moving points
 - examples 45
 - instructions 41-44
 - N points 43
 - point 1 41,43
 - S points 120
 - purpose 40
 - rules 40
- N
- new plots 21,40,41,48,97,102
- new/remasured points 58,93
- new 7M BAF prism plot 89
 - "no tally" points 93
 - no poison oak, please ??
 - trackable trees 86
- nonforest 31
- nonforest inclusion 71
- nonforest use boundary 28
- nonstockable area 69,75
 - mapping 75
 - percent cover 153
- nonvegetated stringer 29
- number,
 - line 91,122,126
 - sequence 64
 - plot 20
- number of points
 - measured at OCC3 58
 - N points 58
 - N/R points 58
 - 0
- oak-madrone 31
- OCC3
 - crown class 106
 - crown ratio 106
 - dbh, trackable trees 96,97
 - GLC 24,26,31
 - height 102
 - plot layout 37,39
- OCC2
 - codes, damage/cause of
 - death and log deduction 145
 - crown class 106
 - crown ratio 106
- one-point plots 21,31,37,39
- organization of this manual 8

- other forest land 31
- other forest,
 - oak-madrone 21,25,31,37,39
 - rocky 21,25,31,37,39
 - unsuitable site 21,25,31,37,39
- owner class 22
 - codes 23
- P
- partial harvest, definition 54
- past disturbance 59
- percent cover
 - by plant species and layer
 - canopy layer 81
 - general tally procedures 80
 - species ion of this manual 8
 - hardwood site 72
 - herbs 83
 - how to record,
 - vegetation profile 79
 - nonstockable area 69,75
 - plant groups 80
 - root disease 73-77
 - shrubs 79
- percent live crown ratio 106
- percentage distribution of total
 - tree volume by log (tables) 115
- Phellinus weirii 73,74
- photos, pinpricking and
 - labeling
 - point 1 34
 - RP 33
- physioclass (aspect/slope) 53,67,151
- pinpricks
 - pinpricks correct? 59,60
 - if N 60
- pinpricked location 34
- planning travel 11
- plant association 49
 - codes 48-50
- plant groups,
 - vegetation profile 79,80
- plant species
 - always considered shrubs 94
 - codes 94
 - reference trees 33-36,154
 - RP 34
 - snags 125
 - stocking trees 121,122
 - trackable trees 94
- planting, definition 56
- planting holes 56

plot
 area classification 47
 area identification 18
 aspect 53
 attribute record, sample 151,152
 jacket 12
 layout diagram 39,59
 kind by sample kind
 objectives 37
 OCC3 39
 location aids 14
 number 20
 packet 14
 physioclase items 53
 referencing and layout 32
 slope 53
 plot attribute record
 sample 151,152
 plots, new 21,37,40,41,48,97,102
 point attribute record
 required tally 150
 sample 153
 point center, marking 86
 point classification 66
 point number
 inhibiting vegetation 123,157
 new points 40,67,151,152
 new/remeasured pts. 40,67,151,152
 Section I,
 point attribute record 67,153
 snags 126
 stocking points 123
 POD 34
 point-of-departure 34
 point 1 location
 moving 41
 pinpricking 34
 referencing 35
 substituting 43
 precipitation 48
 precommercial thin,
 definition 56
 present condition/past
 disturbance 59
 prism plot
 7M BAF snags 125
 7M BAF trackable trees 86
 procedures for editing 133
 purpose of this manual 8
 R
 recent clearcuts, plots 16
 reconstructing (backdating) ??
 recording
 reference trees
 non-tally 36,154
 point 1 34
 snags 128
 tally 36,154
 RP 34
 tree number 95
 reference point (RP)
 marking 33
 pinpricking 33
 recording 34
 re-used trees 34
 selecting 34
 reference trees
 marking 36
 moved points 36
 non-tally trees 36,154
 OCC2 14
 only--(TH 9) 154
 other points 36,154
 point 1 34
 recording 154
 requirements 36,154
 selecting 36
 tally trees 36
 referencing
 all other points 36
 plot 33
 point 1 35
 release letter 135
 remeasured 3.3-m
 fixed-radius plot 86
 remeasured 17-m
 fixed-radius plot 89
 required tally,
 plot attribute record 48,150,151,152
 point attribute record 150,153
 residual removal 54
 roads, constructed, definition 26,27
 roads, new since photography 34
 rocky
 other forest 31
 root disease assessment
 estimating and recording
 percent cover 79
 how to define and
 map area affected 75
 mapping nonstockable area
 and hardwood site 75
 when to collect data 73

RP 33

S

sample design 9

sample kind

codes and descriptions 21

tally requirements by 150

sample plot records 148

Section

I 67

II 69

III, vegetation profile 78

IV, heights of canopy layers 78

seed tree removal,

definition 54

selecting

RP 34

reference trees 36

sequence number 64

17-m fixed-radius plot

hardwood site 72

nonstockable area 69

root disease 73

snags 125

trackable trees 89

vegetation profile 78

shelterwood removal,

definition 54

shrubs

heights of layers 83

percent cover of 79-81

silvicultural treatment

since OCC2 56

site,

hardwood 72

index 62-65

preparation, definition 56

trees

objectives 62

selection 62

size class, stand condition 38

slope

plot average 53

Section I,

point attribute record 67

slope correction table 142

snag decay class 129

snags

snag tally

azimuth 126

data recording 125

dbh 126

decay class 129

definition 125

distance 126

height 127

OCC2 damage/cause of death 128

objectives 125

point number 126

species 126

tree identification and

measurement 126

tree selection 125

use/circumstances of

disappearance 128

soil depth 53

southwest Washington,

inventory of 8

species

always considered shrubs 94

codes 94

reference trees 3654

RP 34

snags 126

stocking trees 122

trackable trees 94

stand condition

for plot layout 38

plot attribute record

(GLC 41,46) 52

stand conversion, definition 56

stand density, stand condition 38

standard plot layout

OCC3 39

stocking tree tally

BH-age 122

data recording 121

dbh 122

height 122

inhibiting vegetation 123

layout and numbering

of stocking points 119

objectives 119

point number 122

species 122

tree identification and

measurement 122

tree selection 120

stream class 67

stream proximity/stream class 67

stringers 26-30

- substituting points
 - examples 45
 - N points 45
 - on the moon ???
 - point 1 43
 - parallel to the equator???
 - points in small areas 44
 - purpose 40
 - stocking points 120
 - III, vegetation profile 78
- suppression (growth impactor) 108,110
 - T
- tally
 - guide, trackable tree tally
 - record 154,155
 - guides, all 149
 - requirements, by
 - sample kind and GLC 150
 - trackable trees 86
 - slugs ???
 - trees, referencing 36
- timberland 31
- TOP 57
- trackable tree
 - identification and
 - measurement 91
 - selection
 - 3.3-m fixed-radius 86
 - 17-m fixed-radius 89
- treatment opportunity 57
- treatments, definitions 56
- tree history, trackable trees 93
- tree identification and
 - measurement
 - snags 126
 - stocking 122
 - trackable 91
- tree layers, heights of 82
- tree number, trackable trees
 - attaching tags 95
 - recording 95
- tree selection
 - reference 36
 - RP 36
 - site 62
 - snags 125
 - stocking 120
 - trackable trees 91
- tree tally
 - snags 125
 - stocking 119
 - trackable 86
- twenty five percent rule,
 - snag height 127
- type of logging 53
 - U
- underplant, definition 56
 - V
- vegetation profile
 - adding new species 81
 - objectives 78
 - fixed-radius plot 78
 - heights of canopy layers 82
 - how to record percent cover 81
 - percent cover of all shrubs 79
 - percent cover of all herbs 81
 - percent cover by plant
 - species and layer,
 - canopy layer 81
 - general tally procedures 80
- volume distribution by log 115
 - W
- walk-thru plot 8,21,37,39,40,48,55,78
 - 3.3-m fixed-radius tally 86-116
 - 17-m fixed-radius tally
 - and 7M BAF prism tally 89-116
- weather (growth impactor) 108,110